

Update on groundfish stock trends for the Gulf of Alaska

Gulf of Alaska Groundfish
Plan Team
December 2007

1,028 pages, 17 chapters,
3 GOA SAFE appendices
23 species or species groups

GOA Plan Team Members

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Nick Sagalkin	ADFG
Bob Foy	AFSC/Kodiak*
Steven Hare*	IPHC
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Kathy Kuletz	USFWS
Ken Goldman	ADFG
Ward Testa	NMML

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Overview

Biennial cycle—"On" year for GOA

9 stocks in Tier 3 (mostly above $B_{40\%}$)

8 in Tier 5, and

2 in Tier 6

"Other species" included for amendment analysis

GOA Ecosystem summary

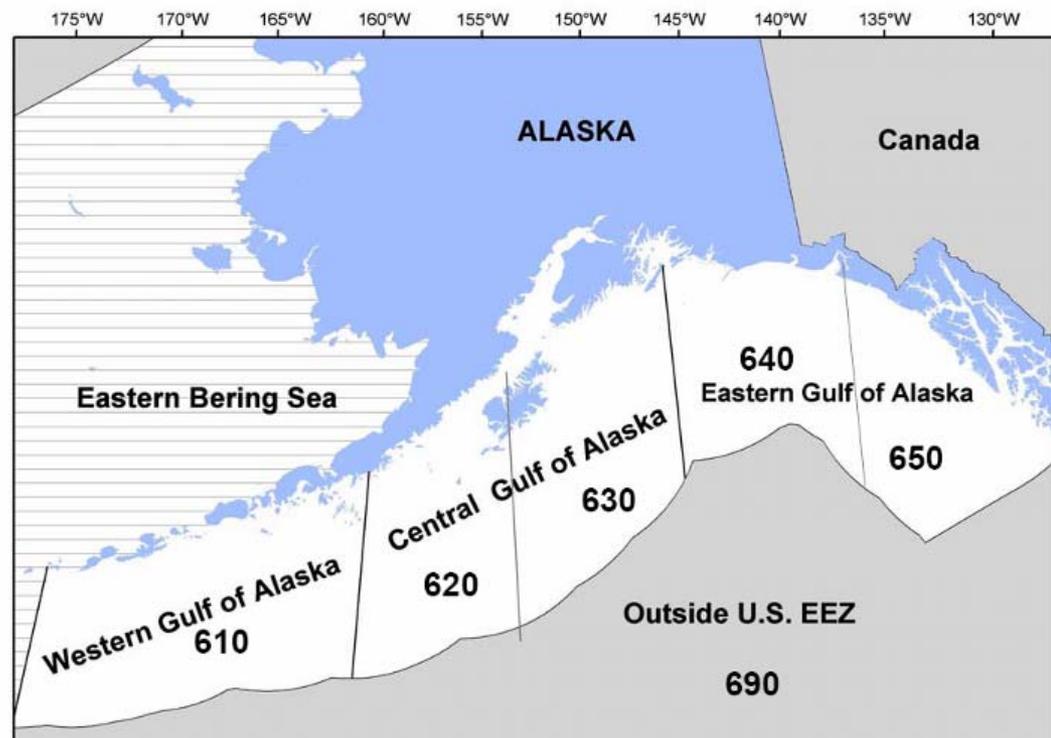
Other issues:

2008 forage fish planned

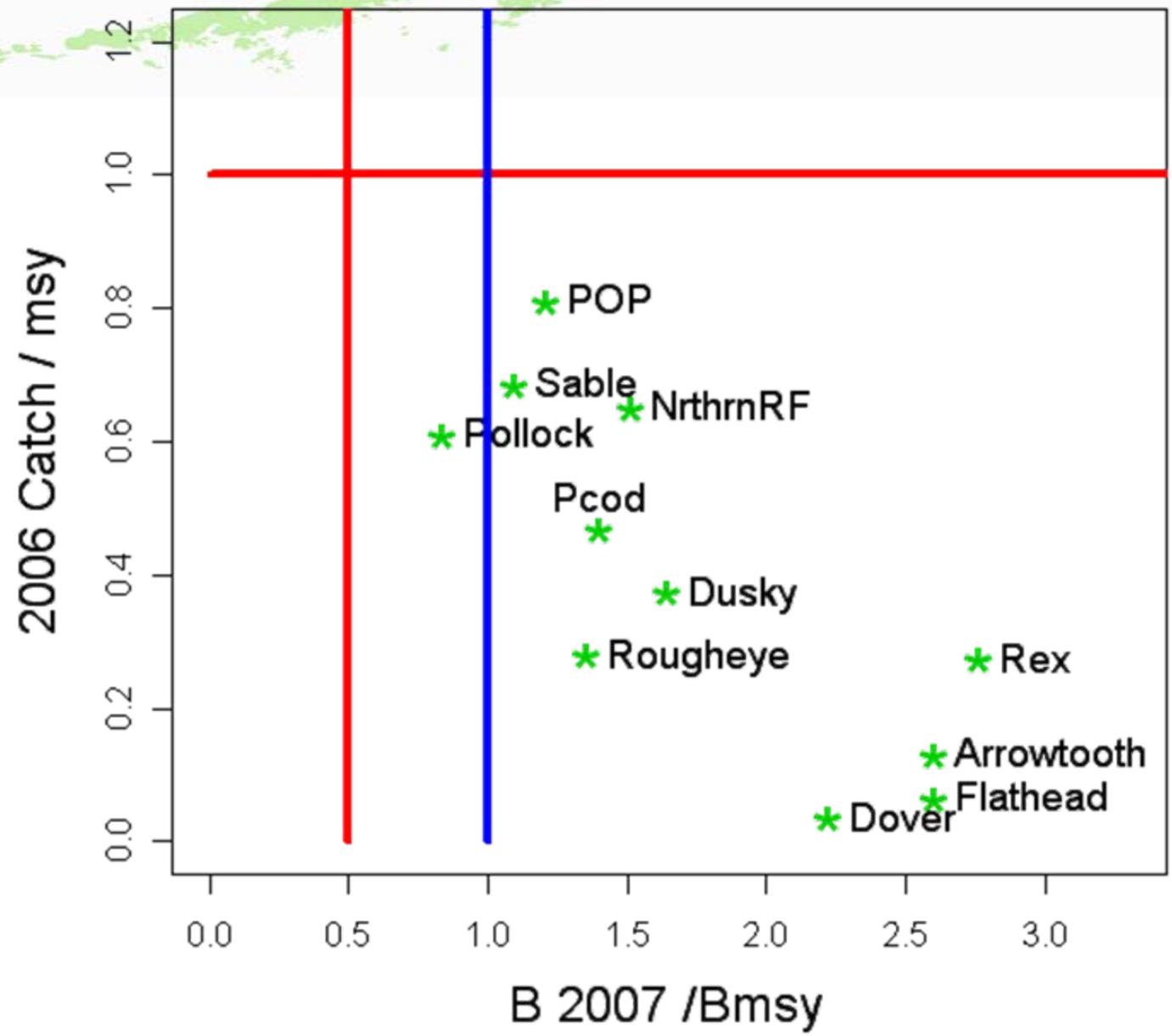
Timeliness of review

Data collection budgets

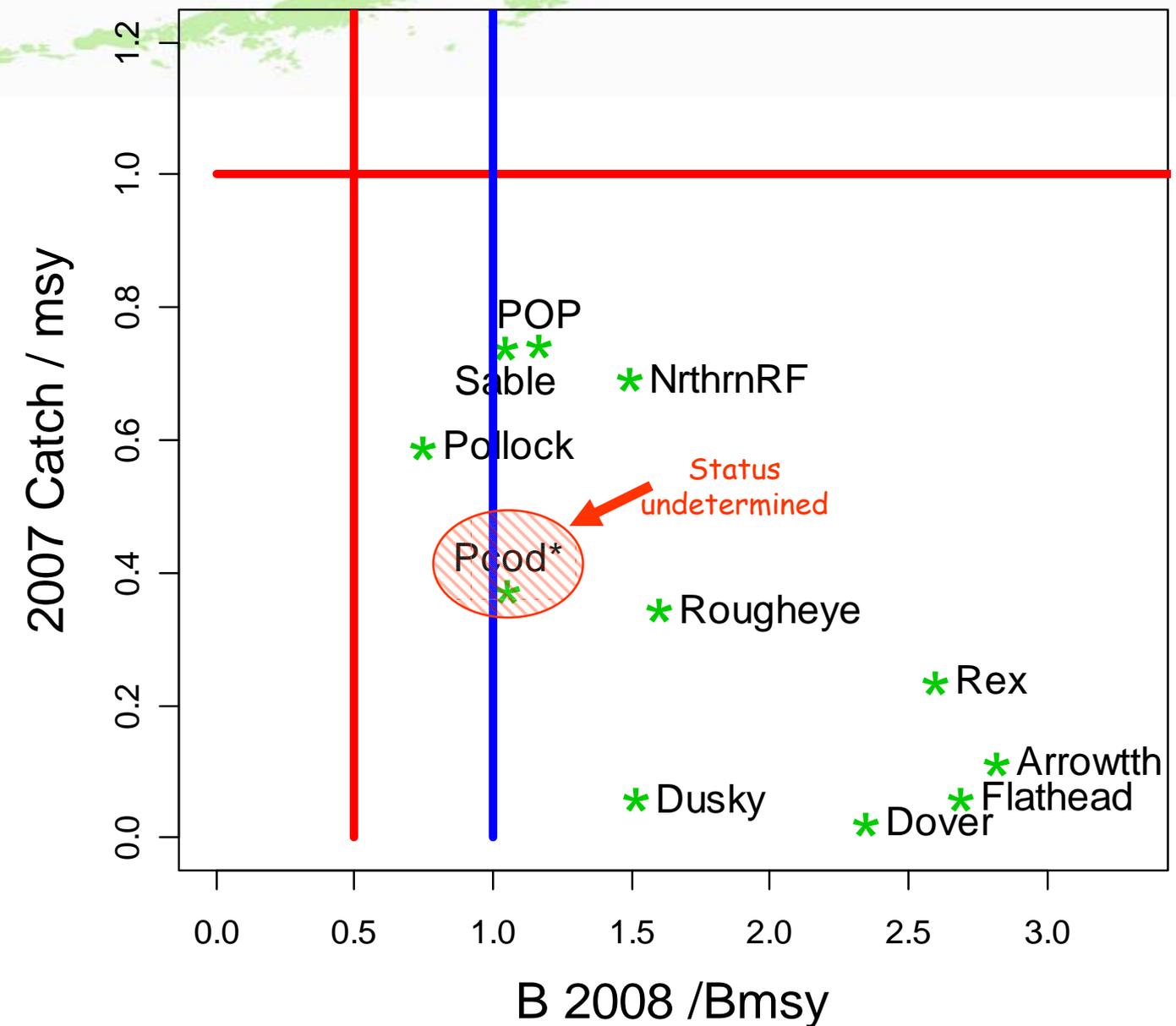
Membership



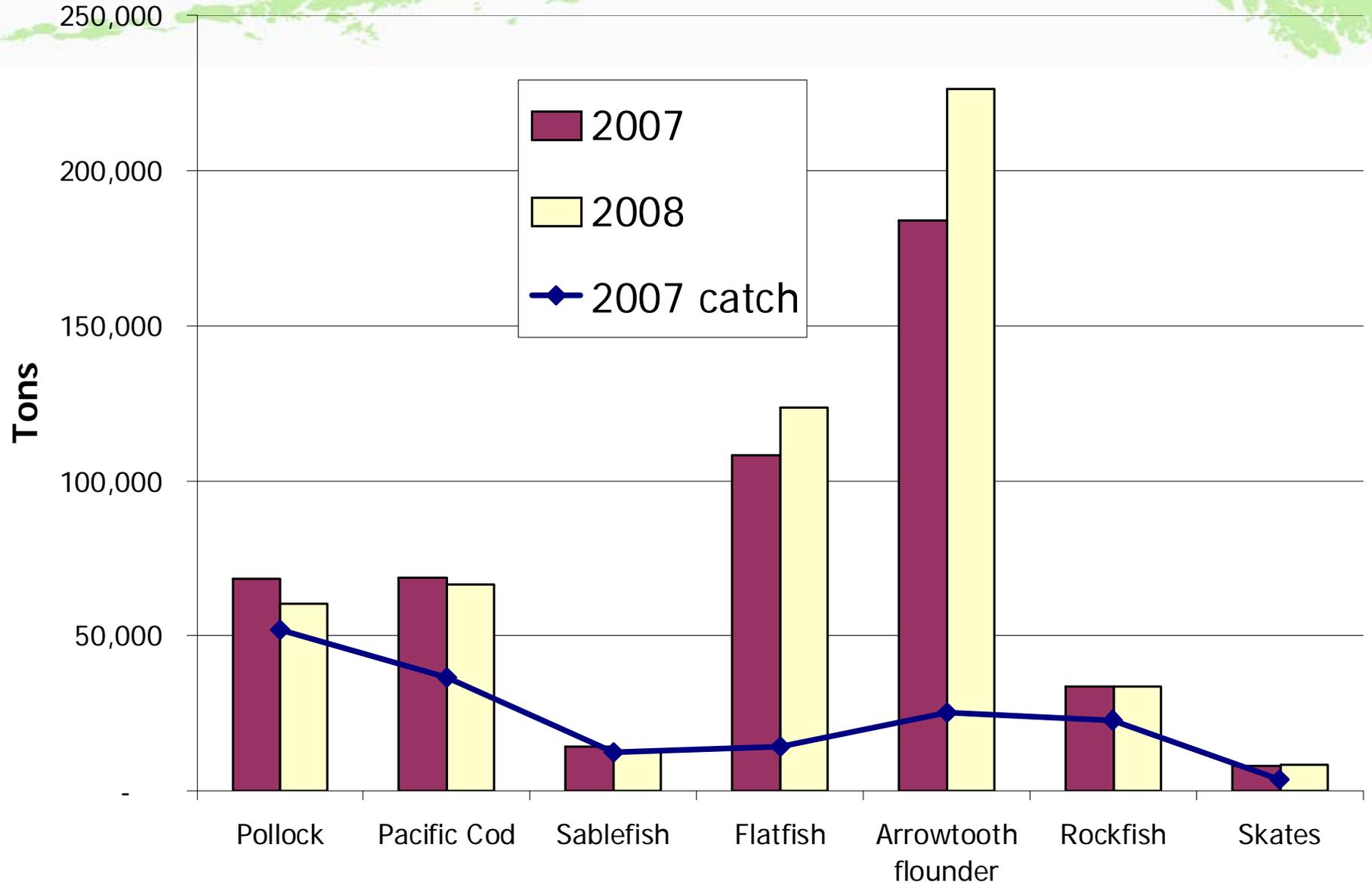
2006 results **Gulf of Alaska**



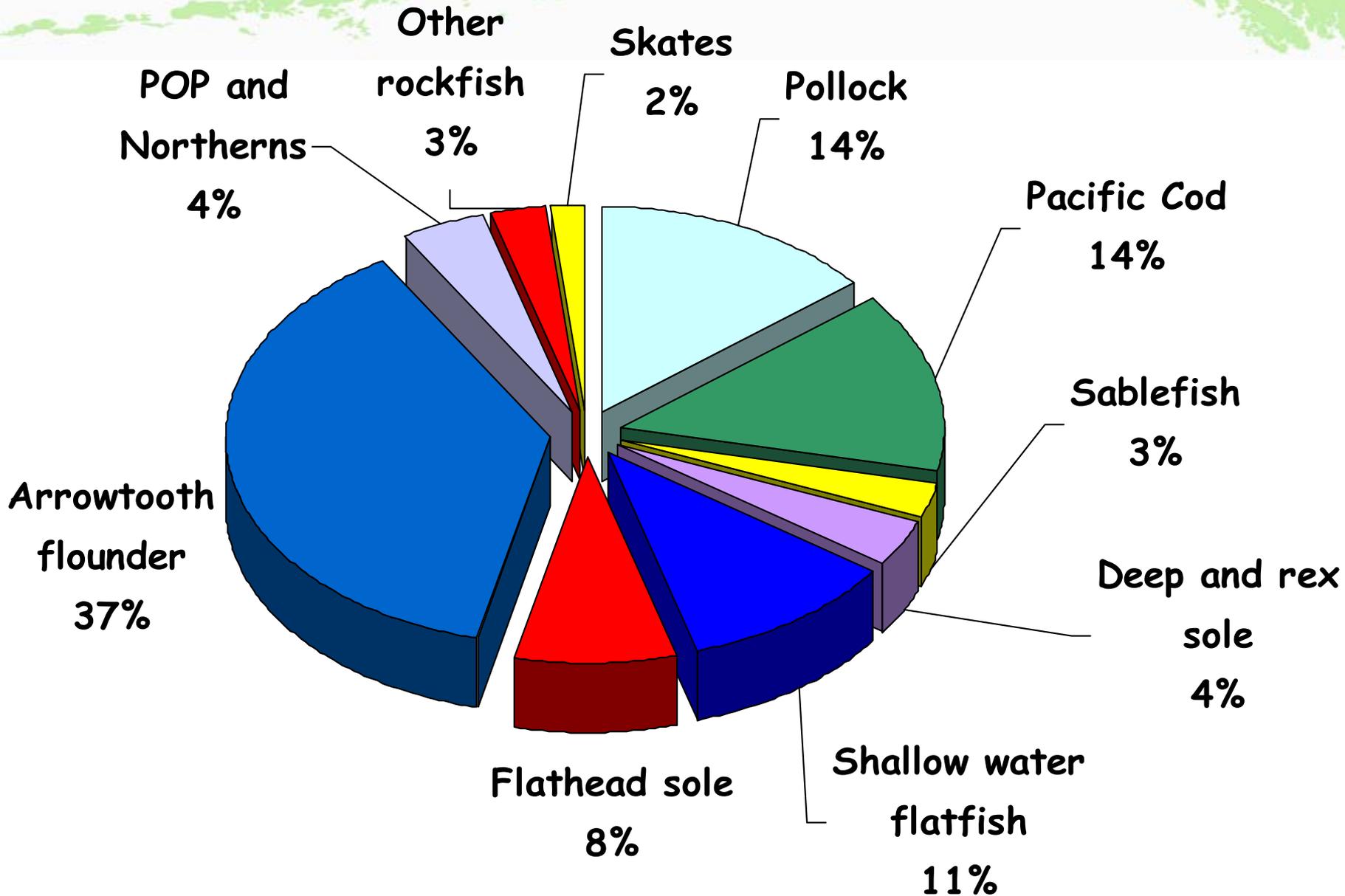
2007 results Gulf of Alaska



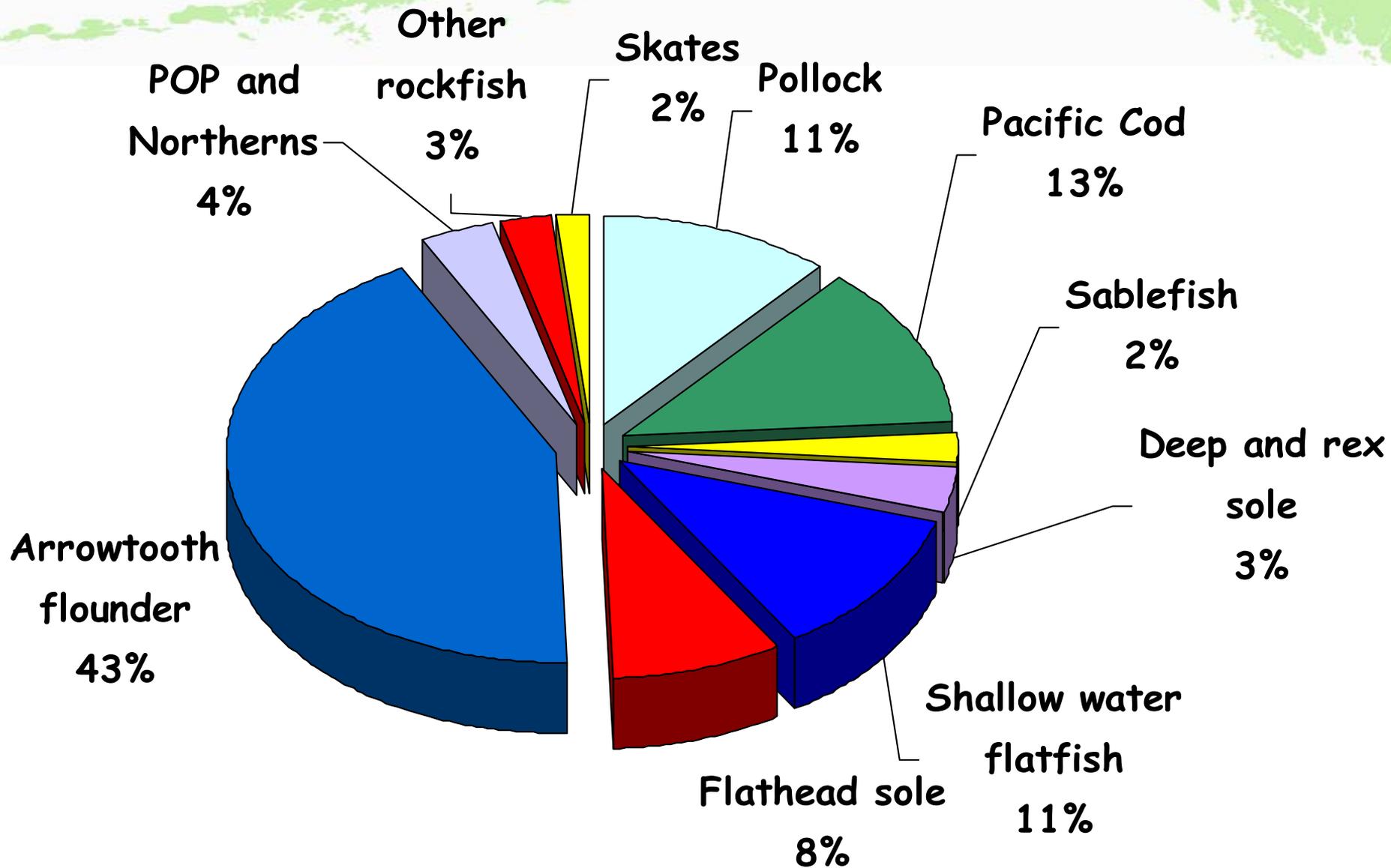
GOA Catch and ABC levels



GOA 2007 ABC's: 490,327 t



GOA 2008 ABC's: 536,191 t



Species overviews

1. **2007 ABC/Catch and recommended change**
2. **Highlights**
 - ♦ New data
 - ♦ Analytic approach (changes)
3. **Stock status and trend**
4. **ABC/OFL**
 - ♦ Tier history and candidacy
 - ♦ 2008, 2009 maxABC; recommended ABC (if $<$ max)

Most detail on pollock, sablefish, Pacific ocean perch

ABC Summary

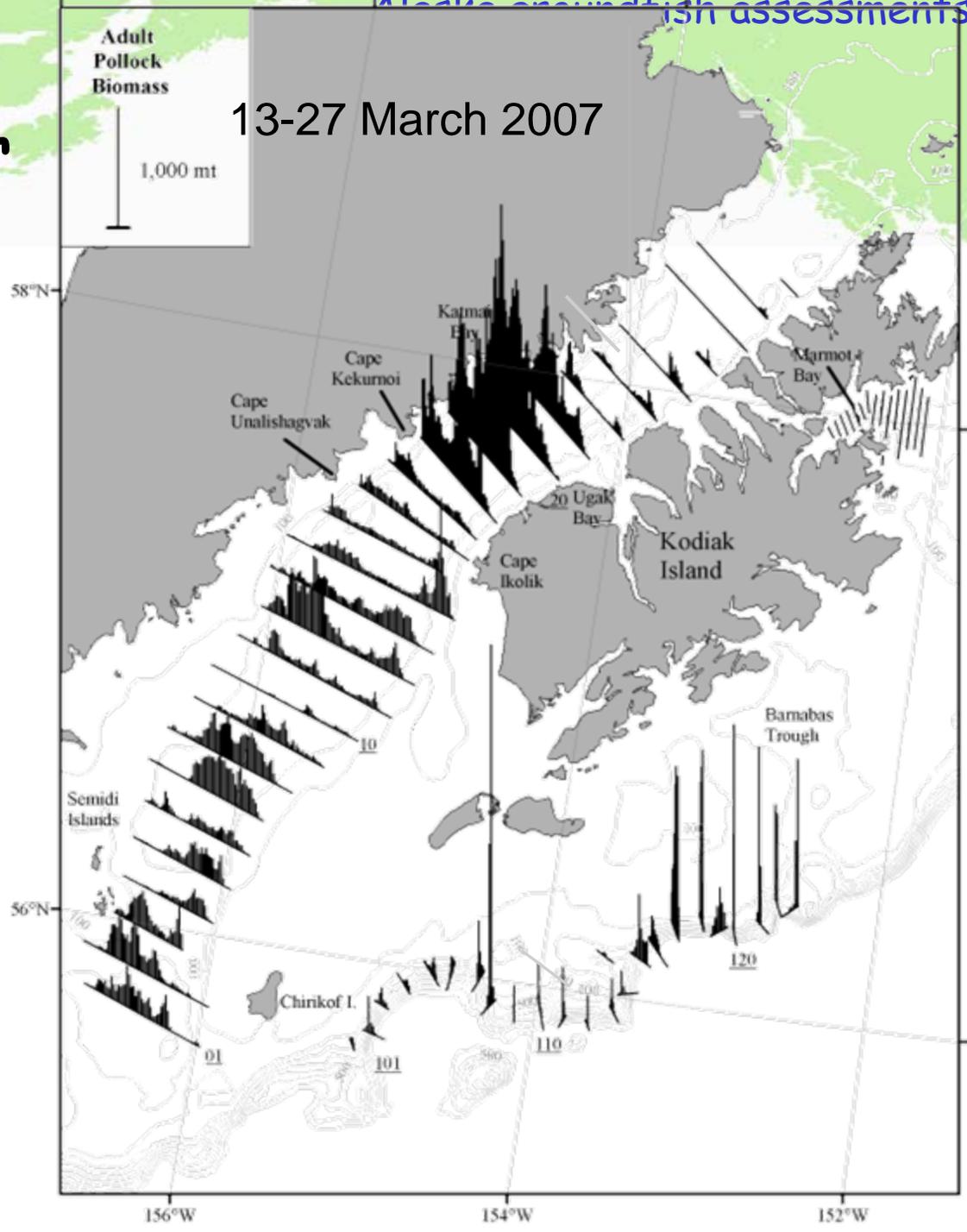
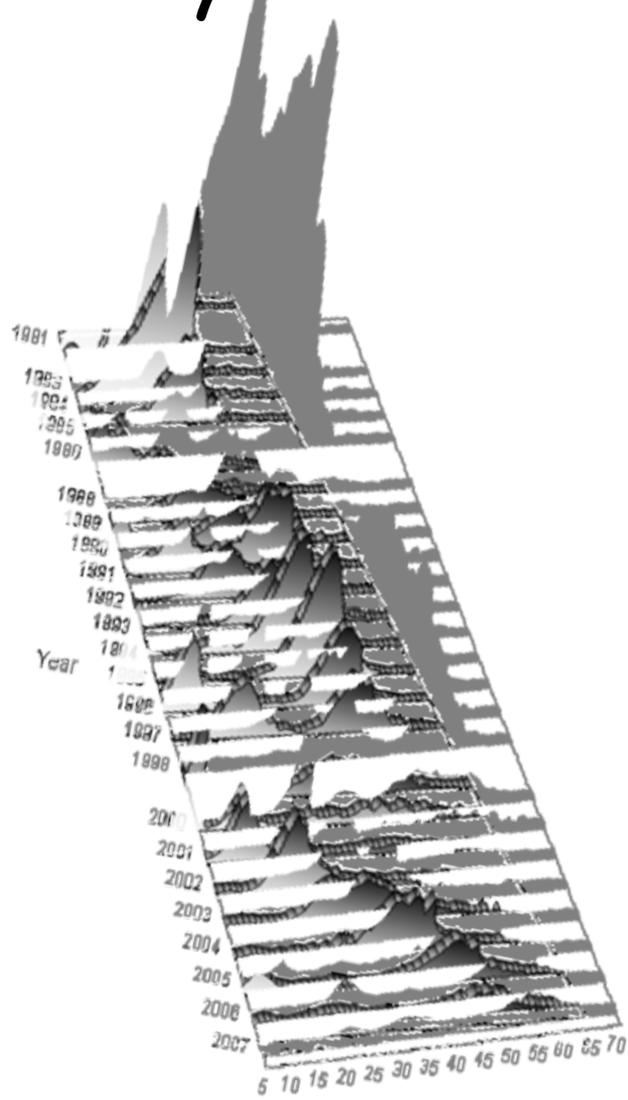


Species	2007 catch	2007	2008	Change
Pollock	51,779	68,307	60,180	down 8,127 (12%)
Pacific Cod	36,696	68,859	66,493	down 2,366 (3%)
Sablefish	12,539	14,310	12,720	down 1,590 (11%)
Flatfish	14,260	108,367	123,759	up 15,392 (14%)
Arrowtooth flounder	25,073	184,008	226,470	up 42,462 (23%)
Rockfish	22,816	33,720	33,548	down 172 (1%)
Atka mackerel	1,441	4,700	4,700	same (0%)
Skates	3,498	8,056	8,321	up 265 (3%)
Total	168,102	490,327	536,191	up 45,864 (9%)

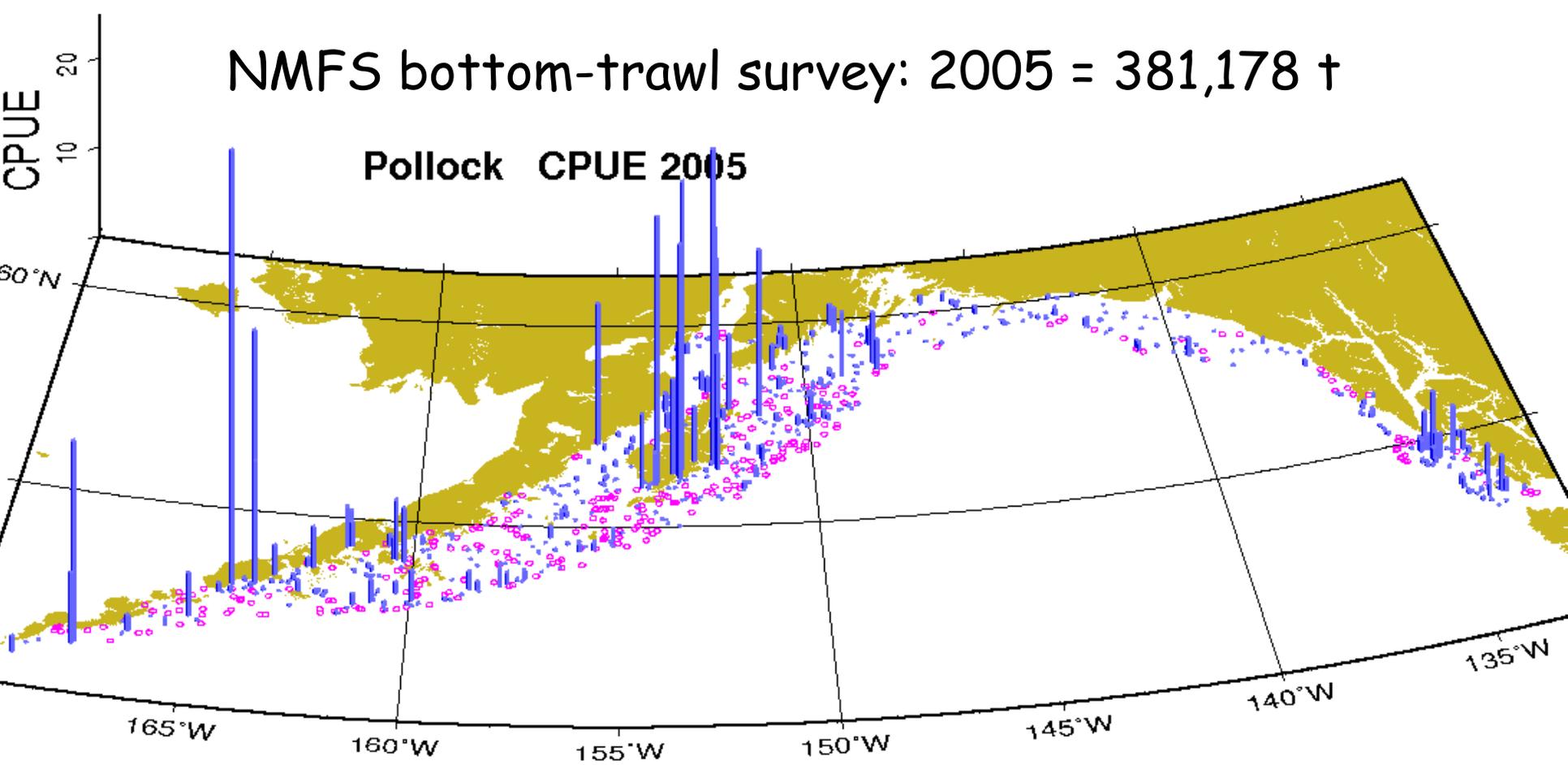
Summary: Page 12

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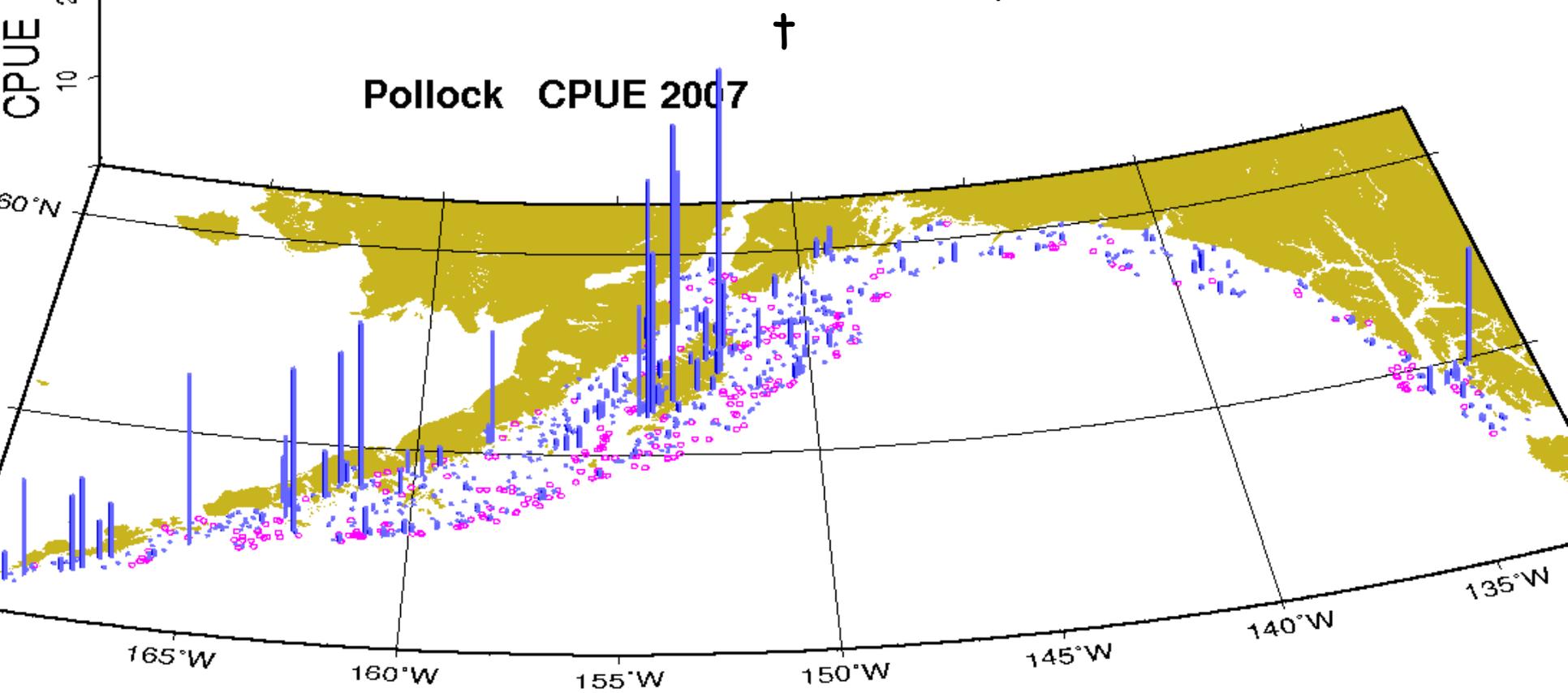
Length, time, Shelikof winter survey...

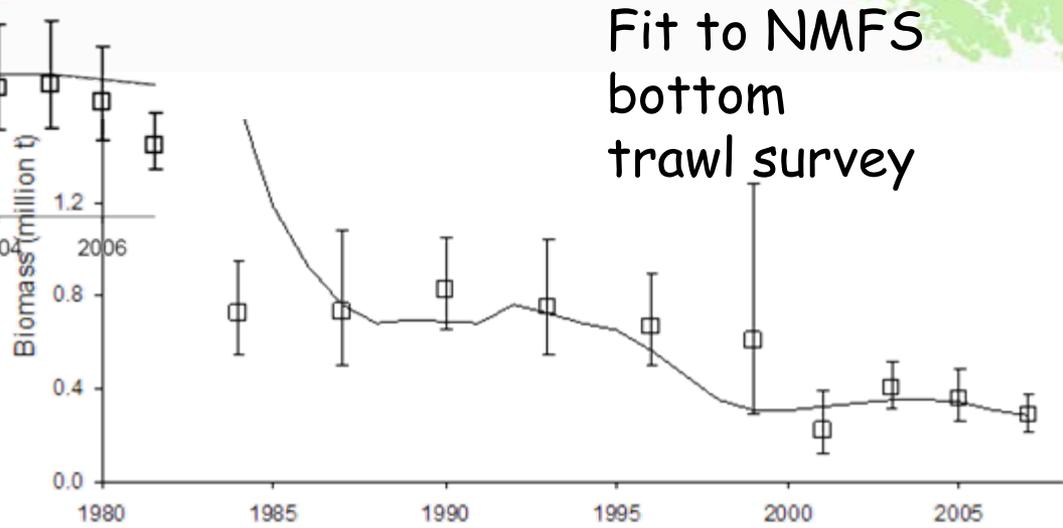
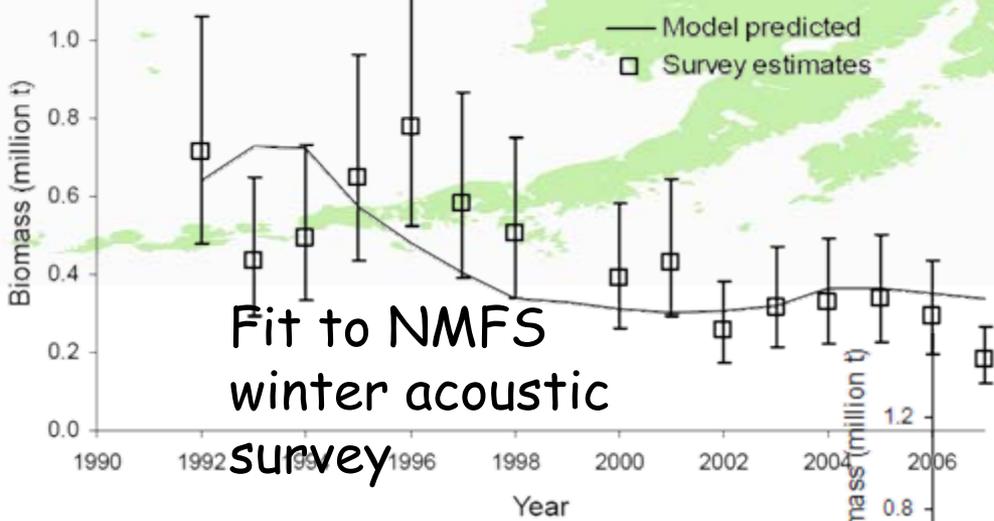


NMFS bottom-trawl survey: 2005 = 381,178 †

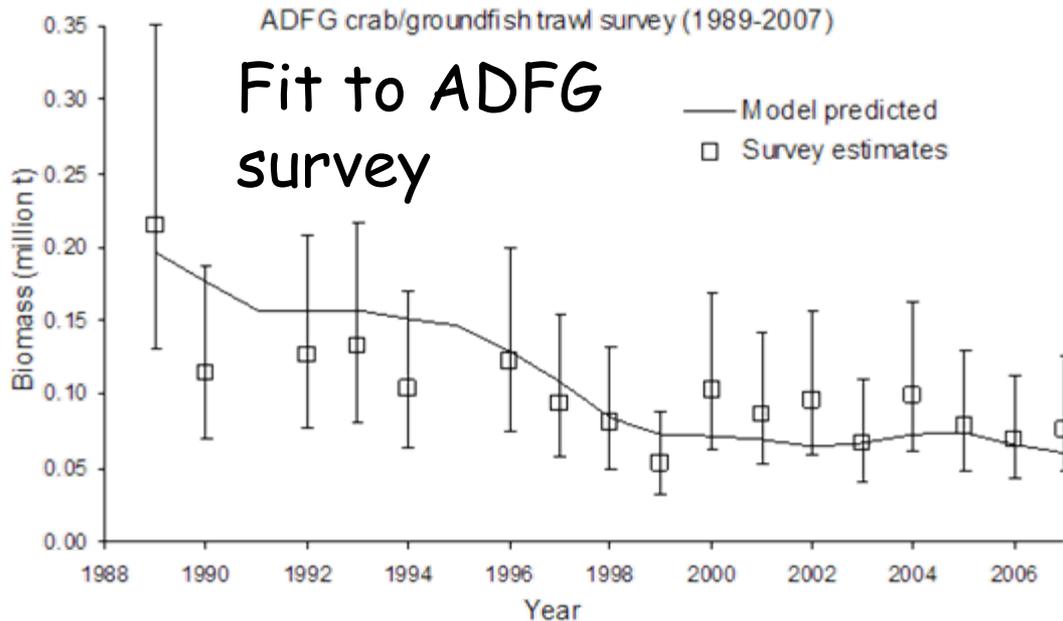


NMFS summer bottom-trawl survey: 2007 = 316,122



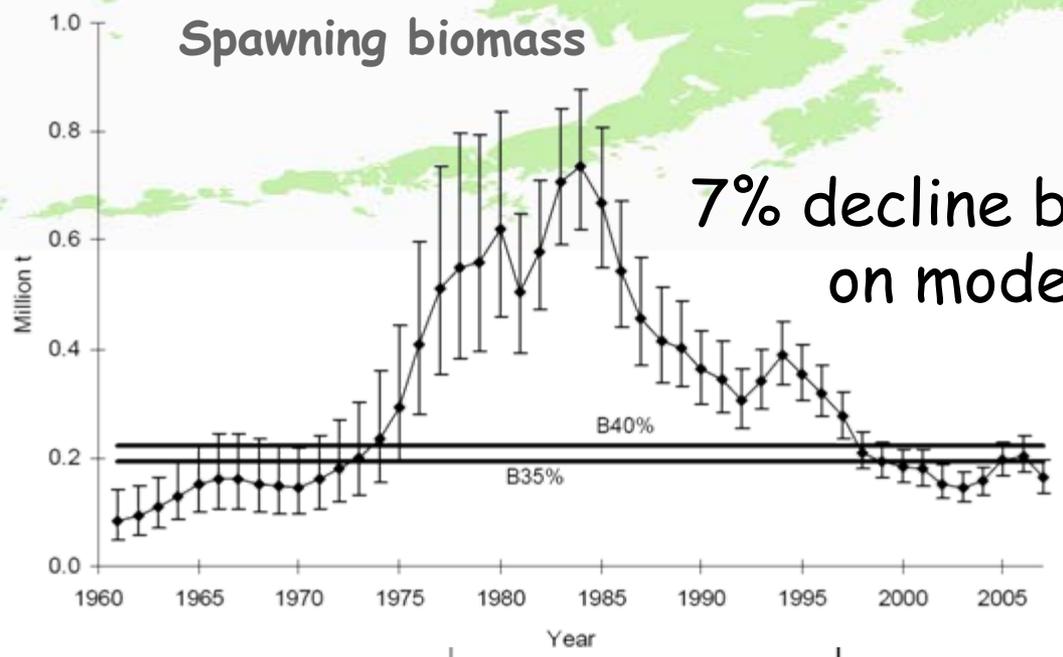


GOA pollock surveys

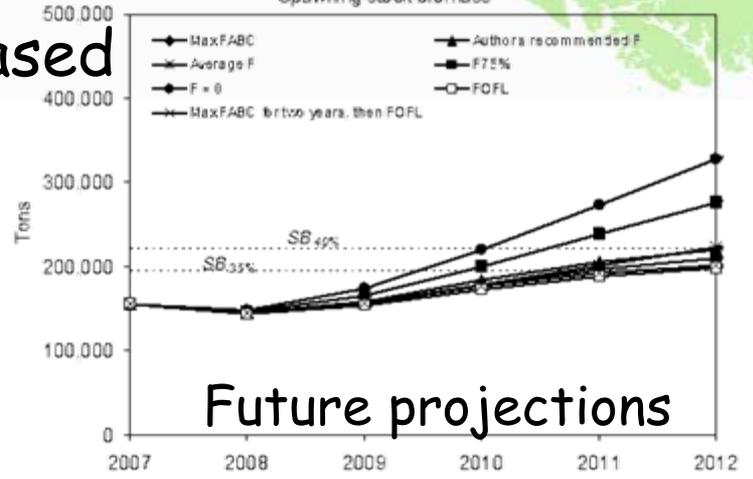


Female spawning biomass

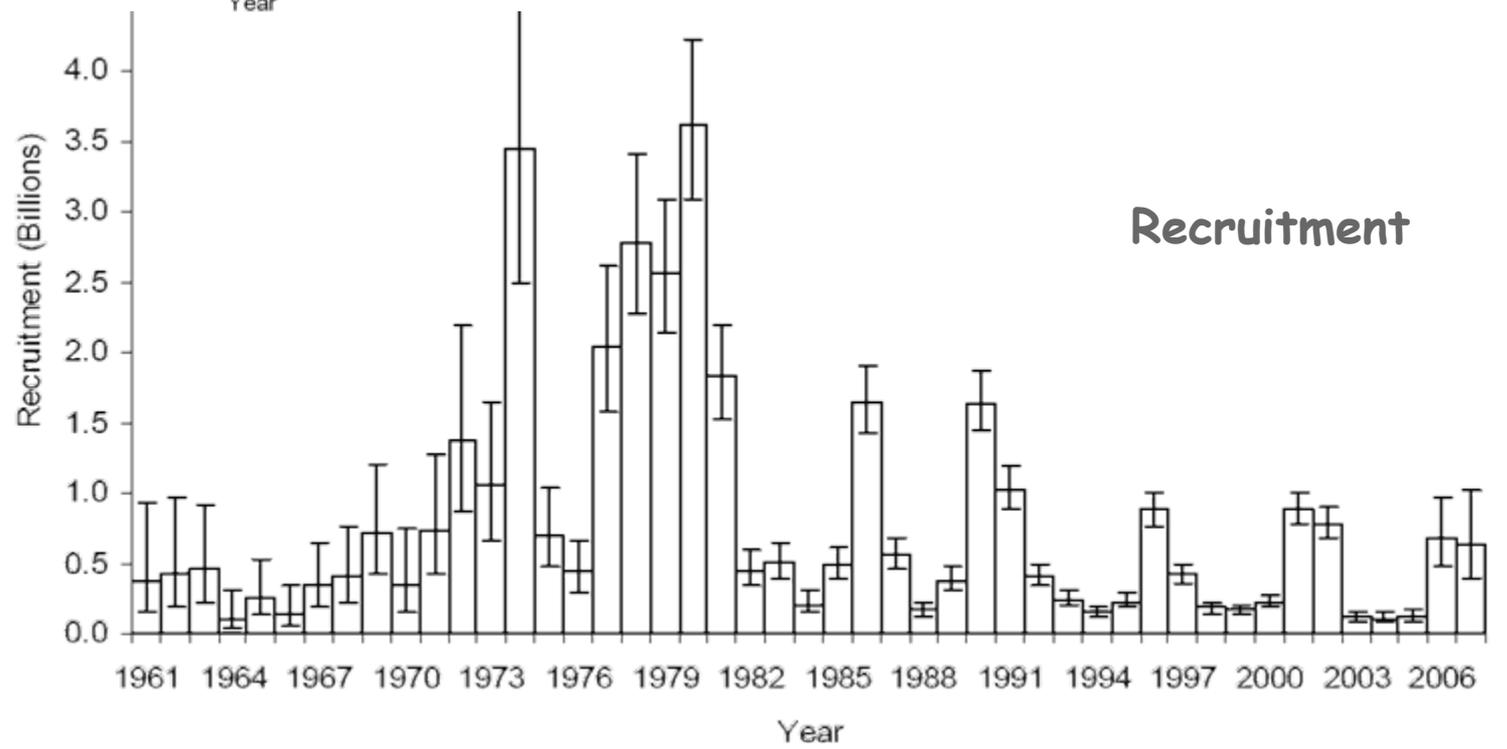
Spawning biomass



Spawning stock biomass



Pollock model results



GOA pollock ABC/OFL considerations

Recommendation conservative

(~54% of max ABC):

- ♦ Trawl survey catchability set to 1.0
- ♦ Harvest rate below maximum permissible FABC

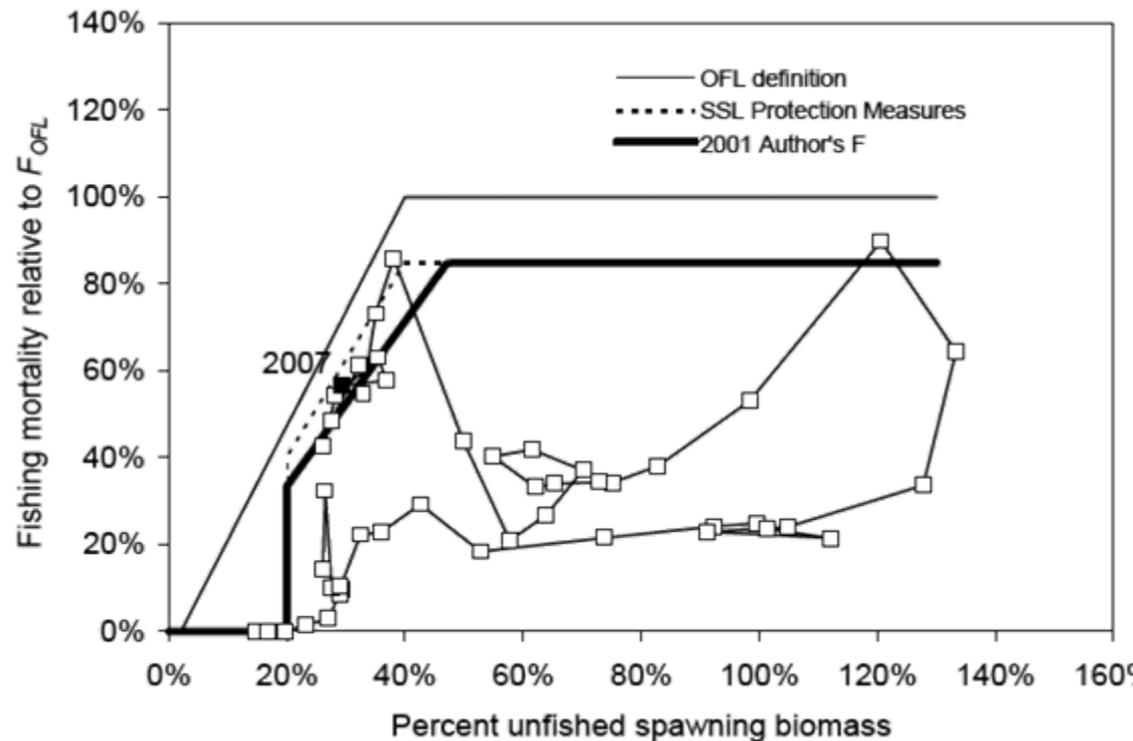
Tier 3b

2008 SSB 26% of $B_{100\%}$

East GOA (Tier 5):

Stable biomass
ABC = 8,280 †

Pollock	Biomass	OFL	ABC
2008	741,819	83,150	60,180
2009		106,980	78,170



ABC Summary

Pacific cod

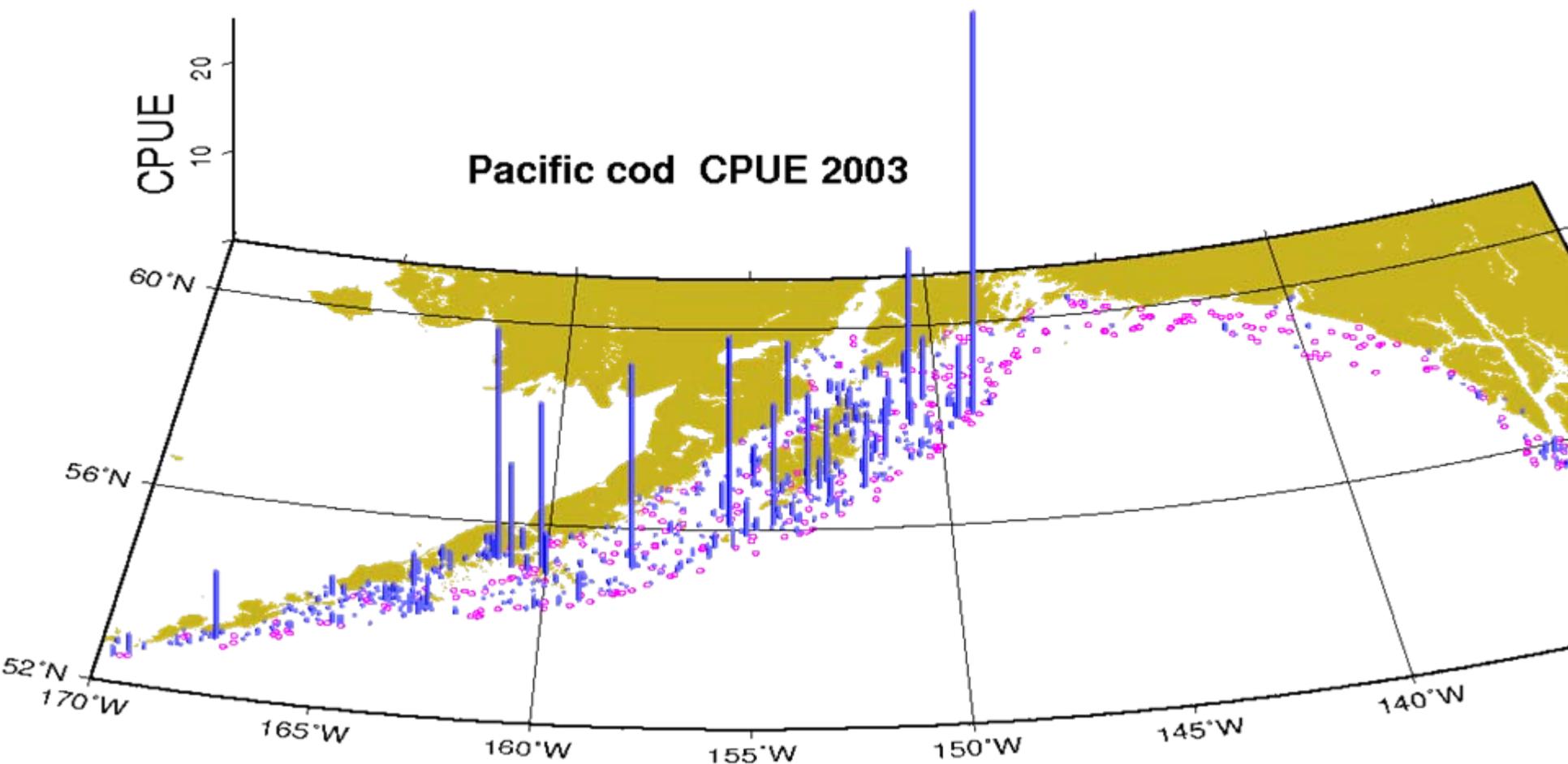


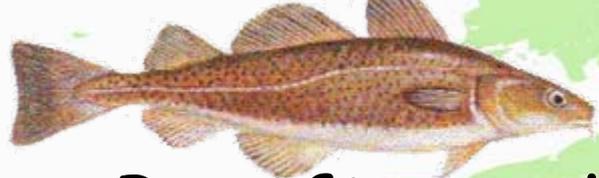
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Summary: Page 13
Chapter: Page 169

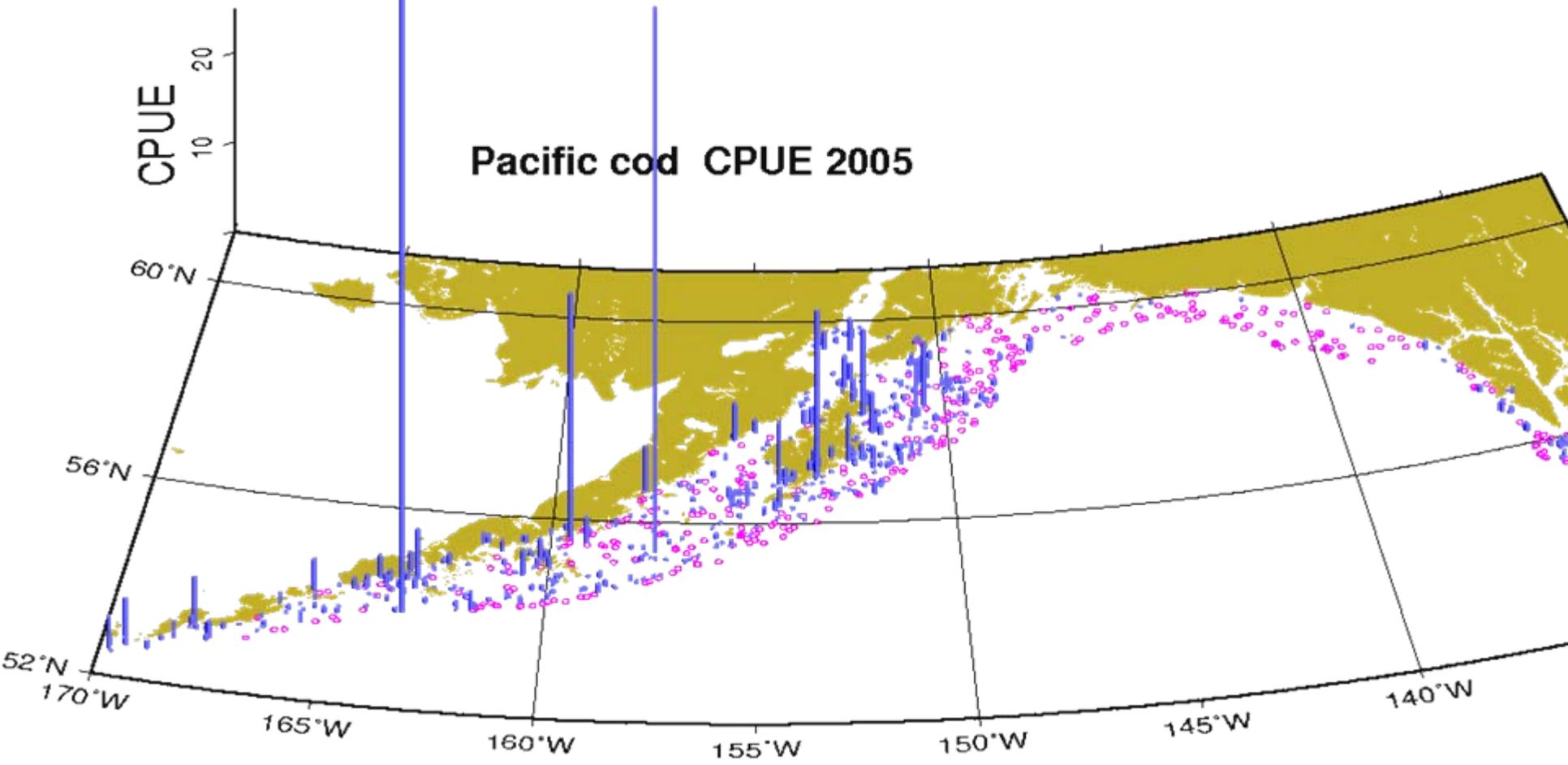


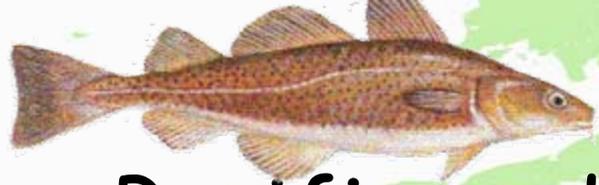
Pacific cod survey: 2003 297,402 †



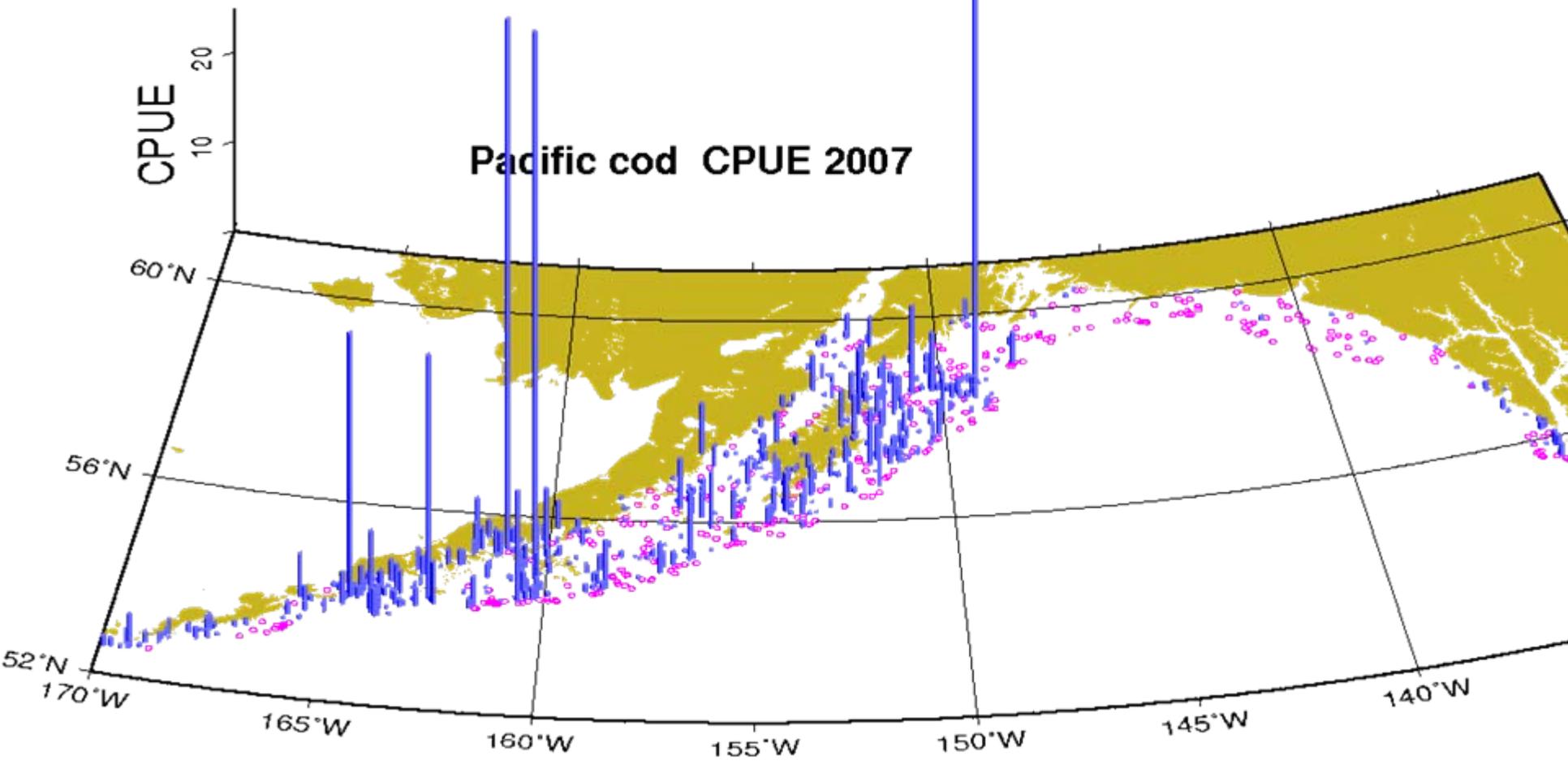


Pacific cod survey: 2005 308,091 †



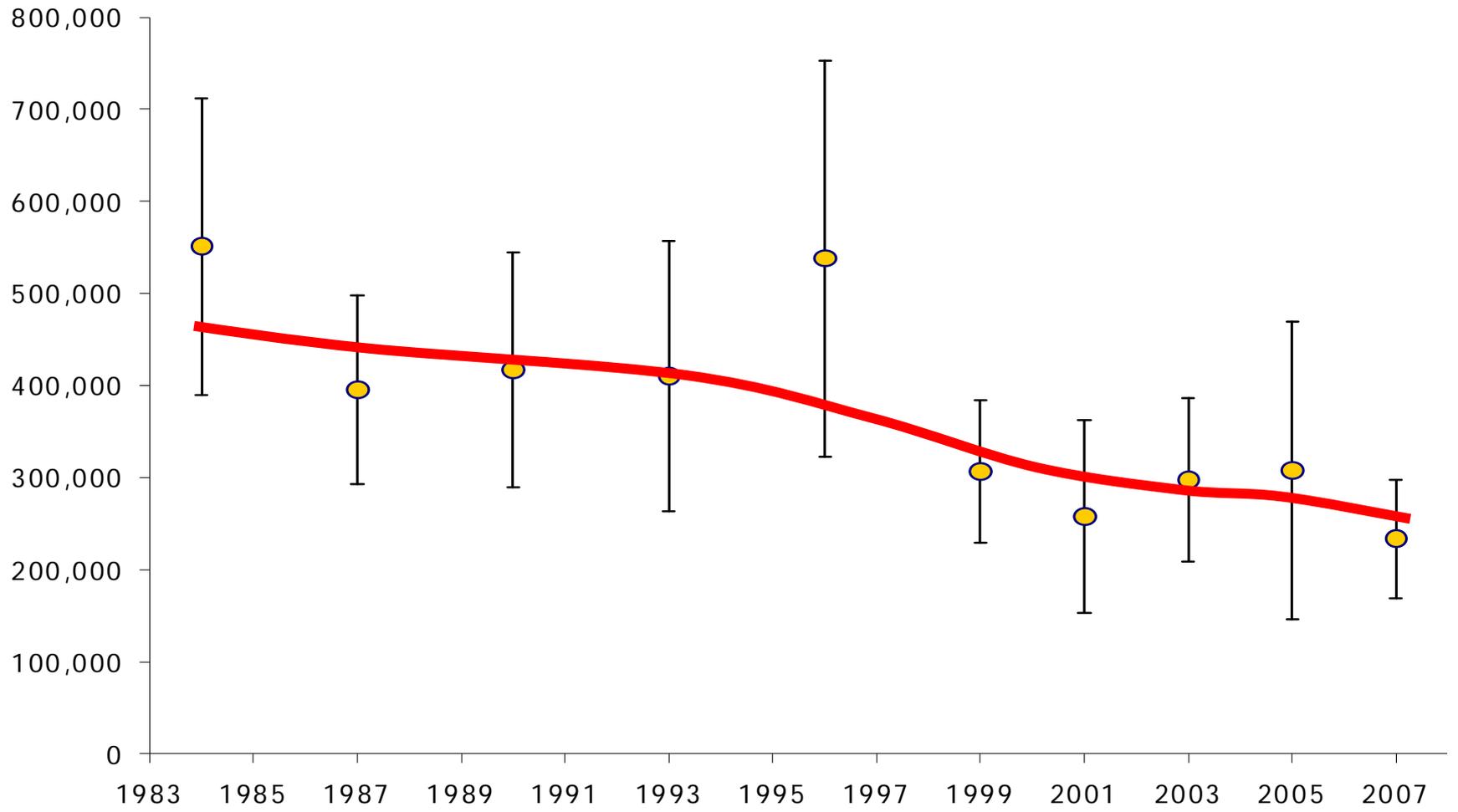


Pacific cod survey: 2007 233,310 †





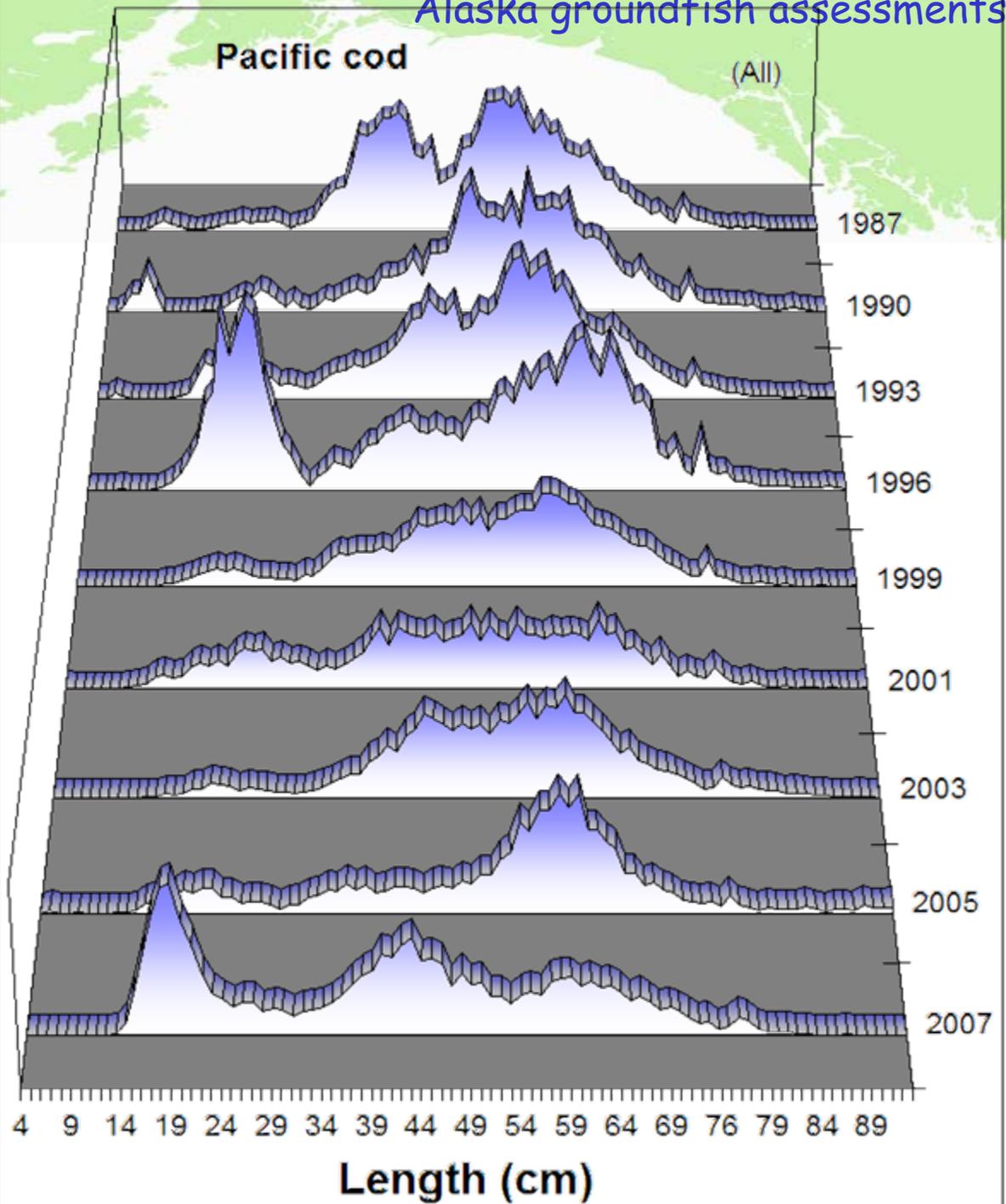
Pacific cod survey biomass estimates





Pacific cod

Survey
abundance
at-length





Pacific cod ABC/TAC considerations

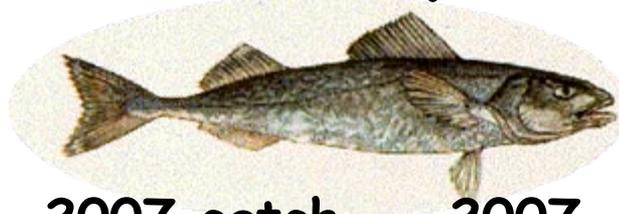
Team agreed, given lack of adequate time for review, any model presentation would serve a limited role in evaluating stock status

- ♦ Extensive BSAI cod modeling precluded work on GOA assessment
- **Team made several requests for presentation of new model in Sept 2008**
 - ♦ Opted for Tier 5 ABC which reflected decline in survey biomass from 2005-2007
 - ♦ Catch has been almost half of ABC in 2007

Pacific cod	Biomass	OFL	ABC
2008	233,310*	88,660	66,493
2009		88,660	66,493

ABC Summary

Sablefish

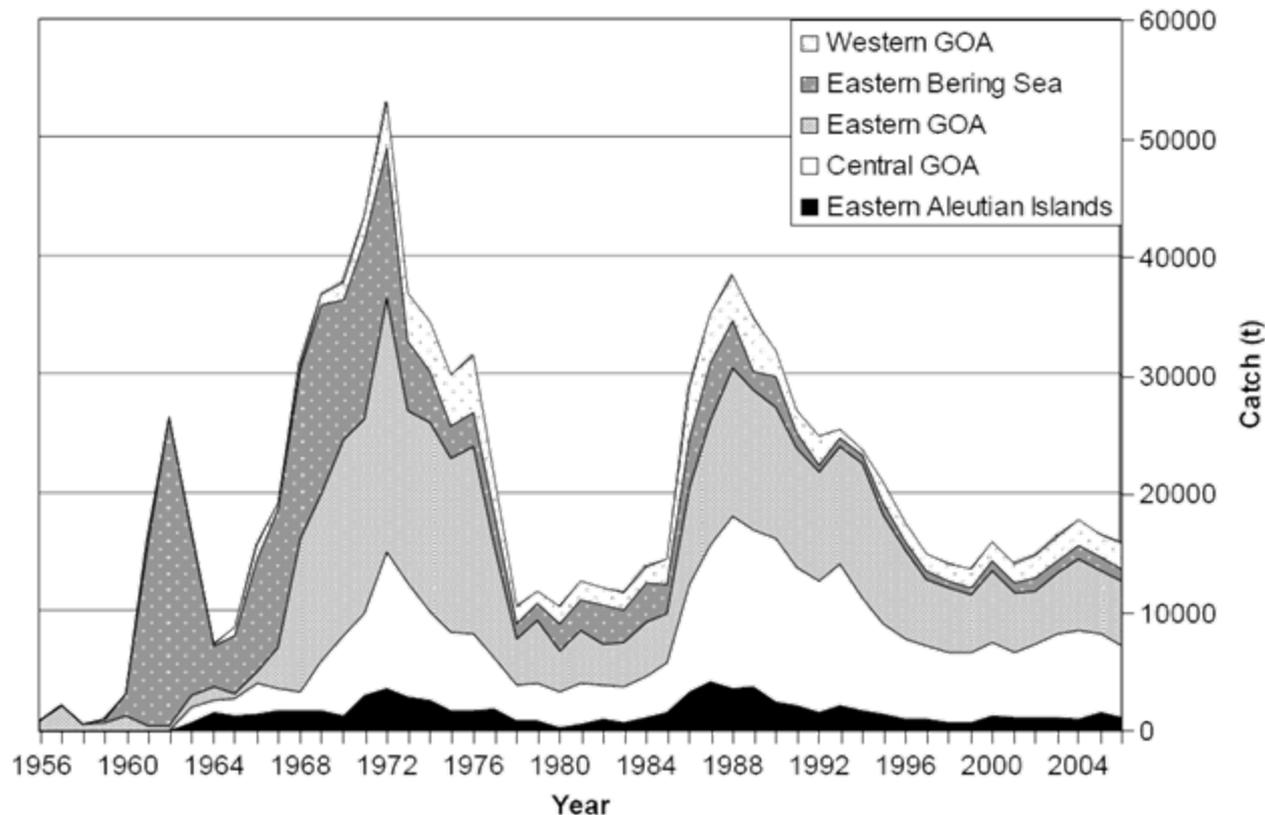


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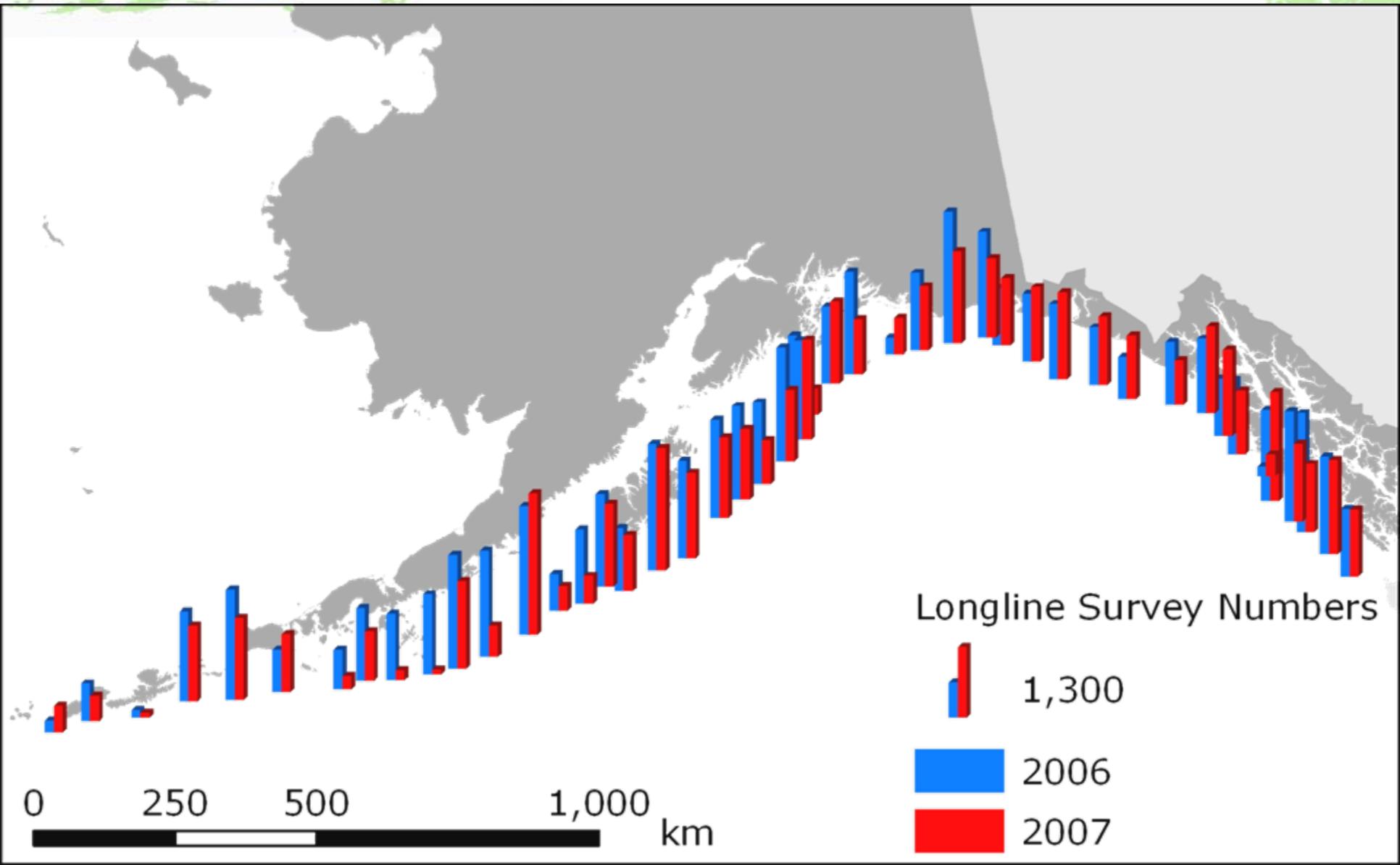
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Sablefish

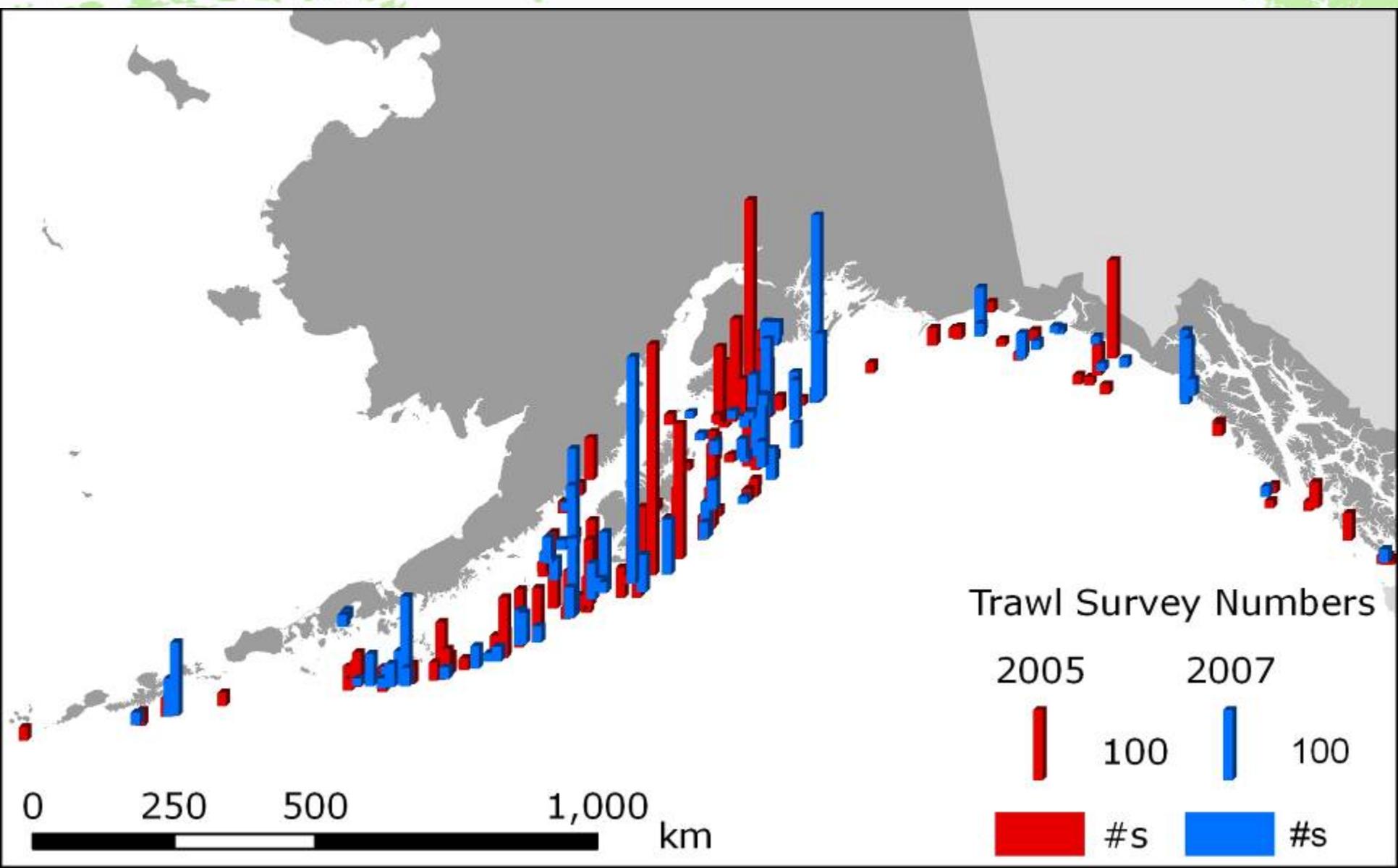
- **The survey abundance index down 14% from 2006**
 - ♦ But increased 13% 2005 and 2006
- **Spawning biomass stable from 2007 to 2008**
 - ♦ Expected to decline through 2012



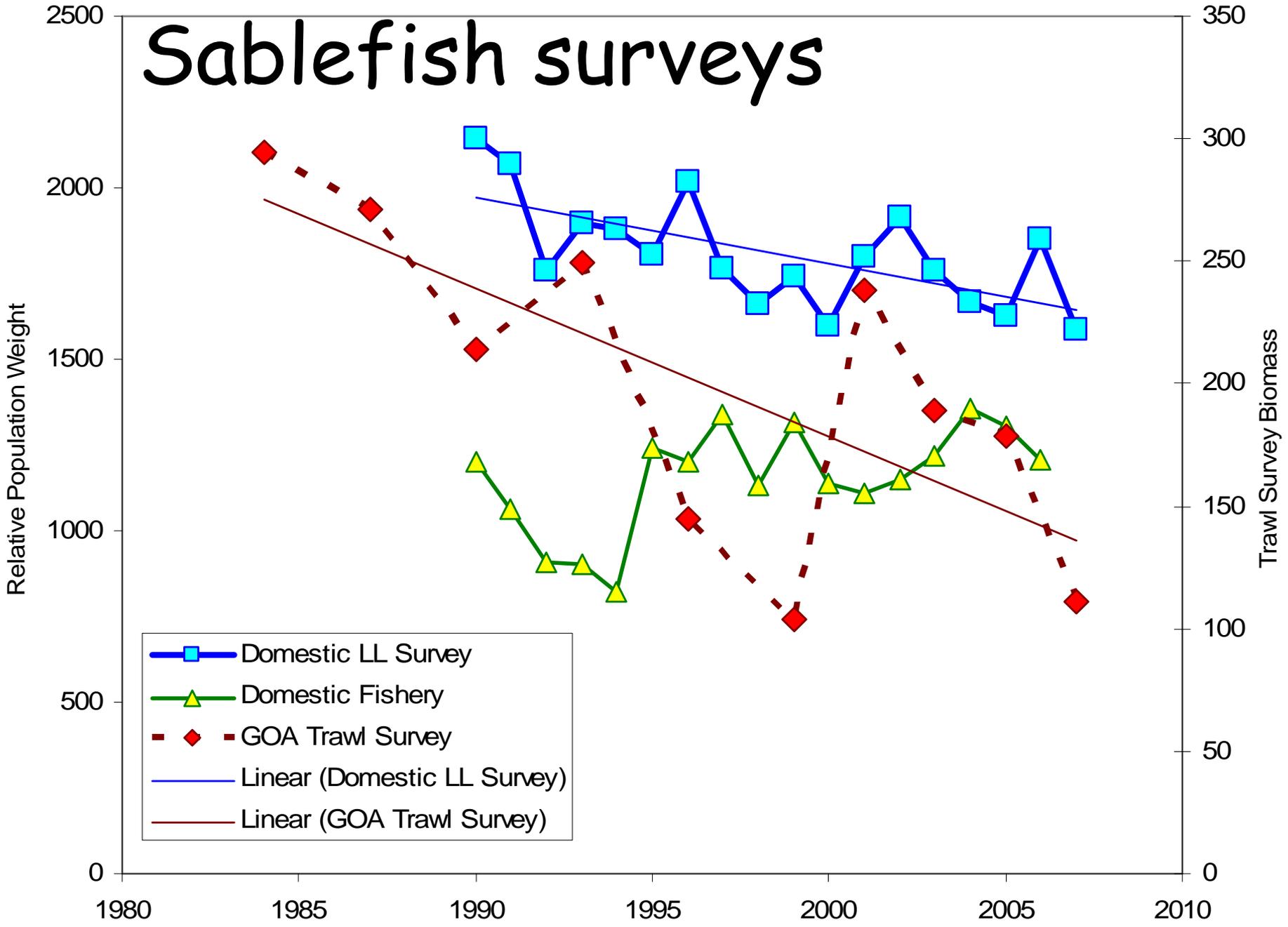
NMFS sablefish longline survey



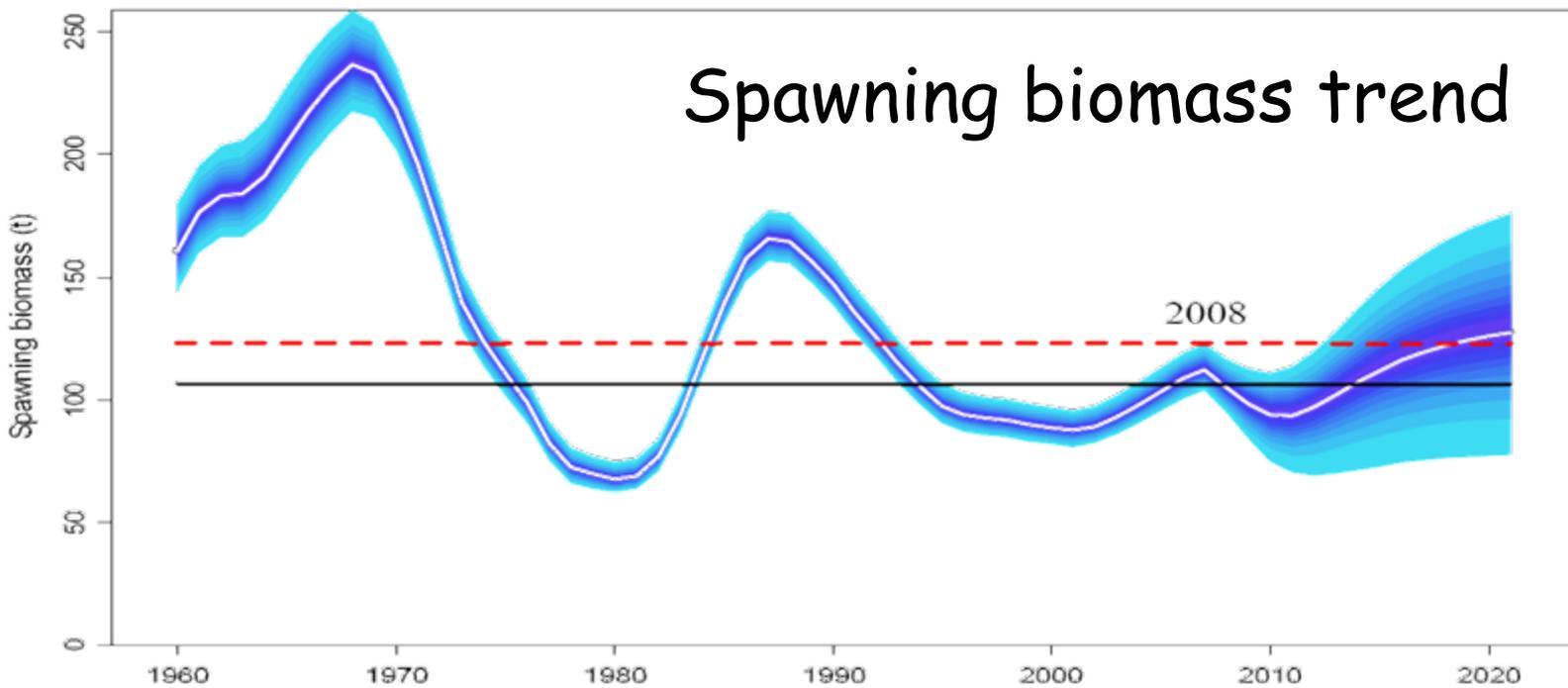
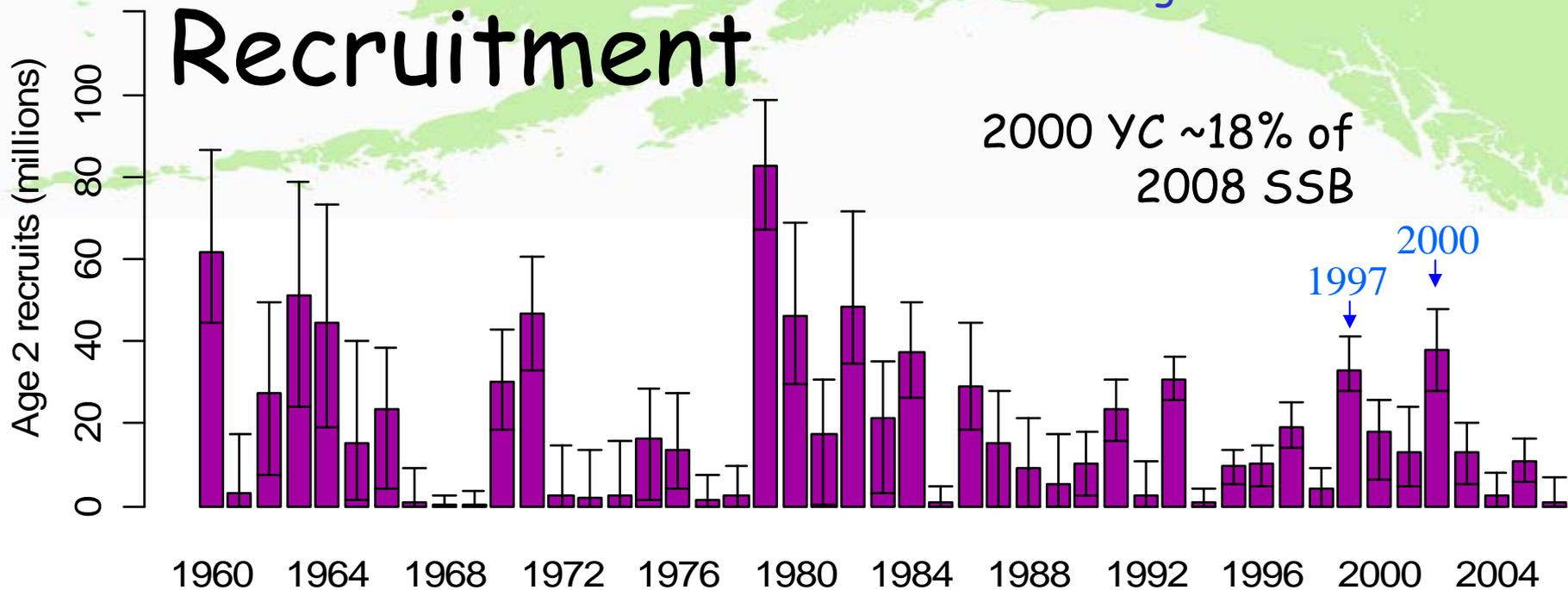
GOA trawl survey sablefish



Sablefish surveys



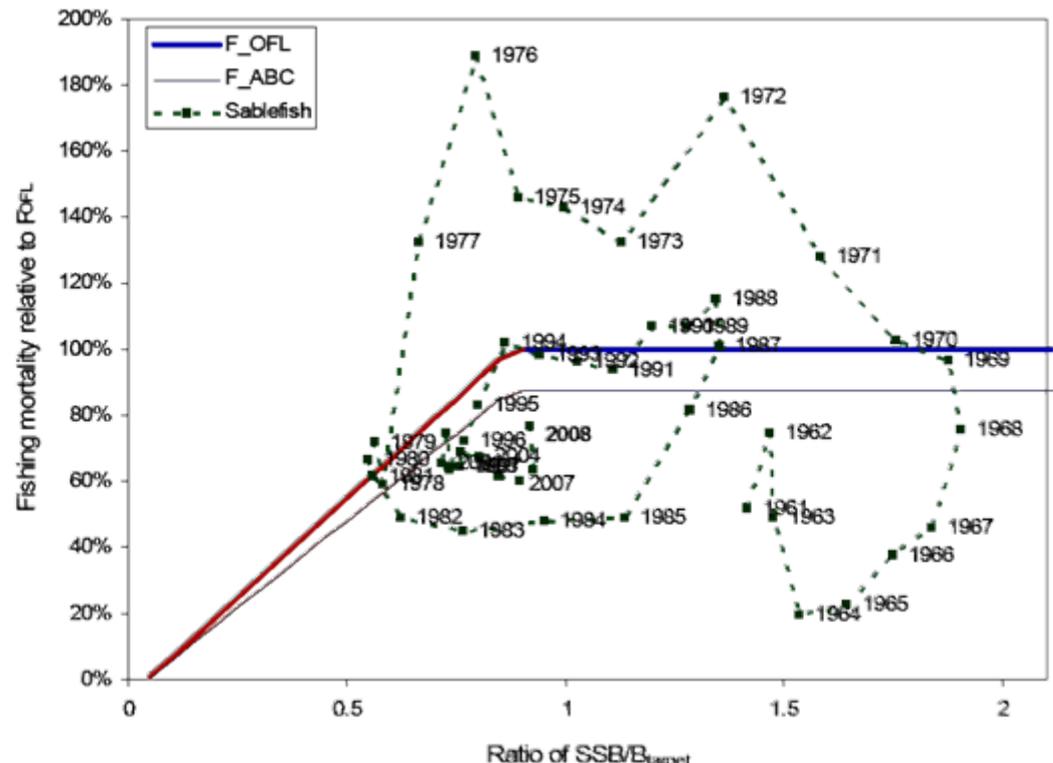
Recruitment



Sablefish ABC/OFL

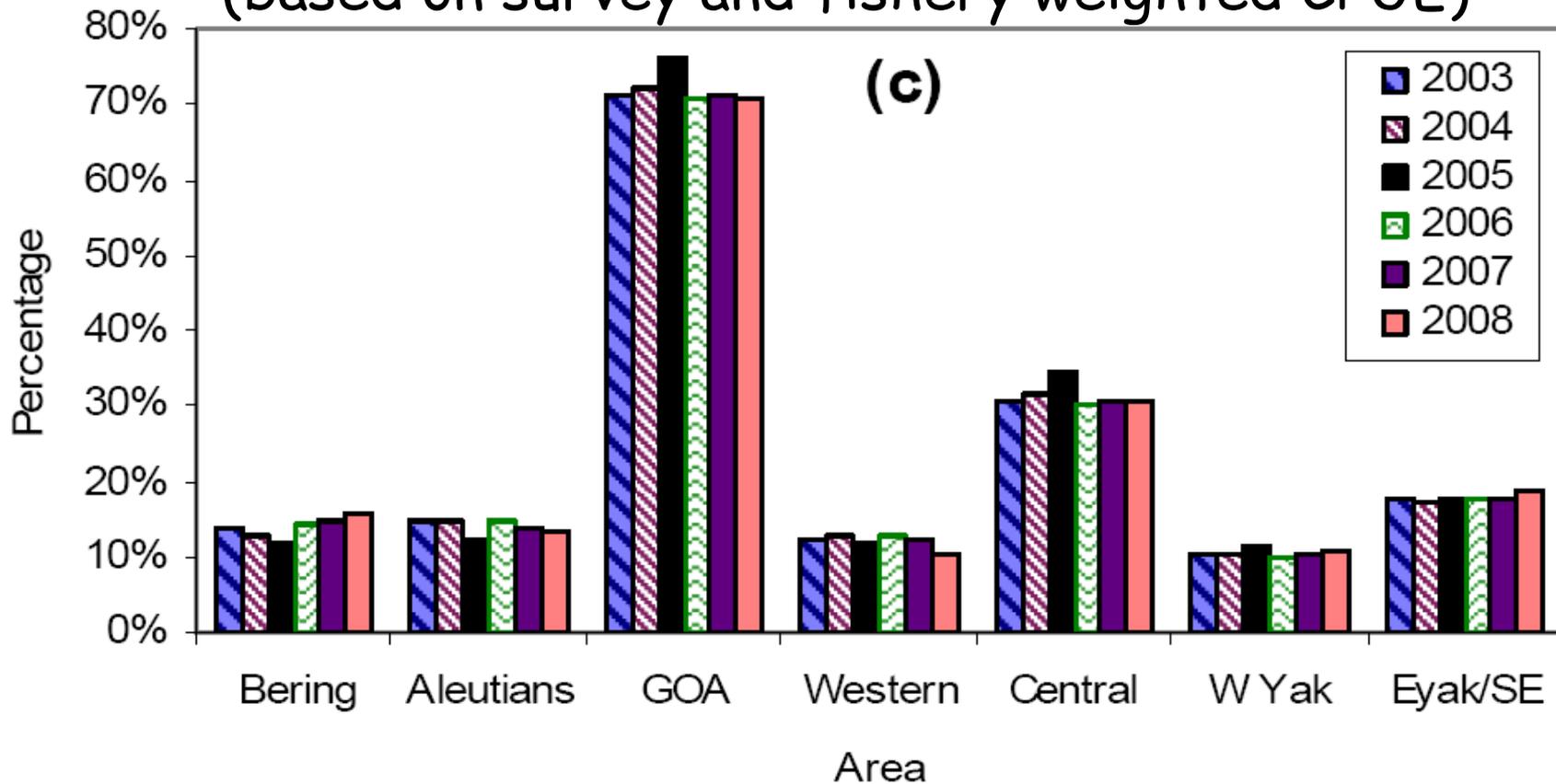
37% unfished spawning biomass, Tier 3b

Sablefish	Biomass	OFL	ABC
2008	167,000	15,040	12,730
2009		12,924	11,624



Apportionment

(based on survey and fishery weighted CPUE)



Team reviewed alternative

Concluded either approach is reasonable
(i.e., no conservation concerns).

But cautioned about increased reliance on fishery CPUE

Flatfish ABC Summary



Species	2007 catch	2007	2008	Change
Pollock	51,779	68,307	60,180	down 8,127 (12%)
Pacific Cod	36,696	68,859	66,493	down 2,366 (3%)
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Flatfish ABC's

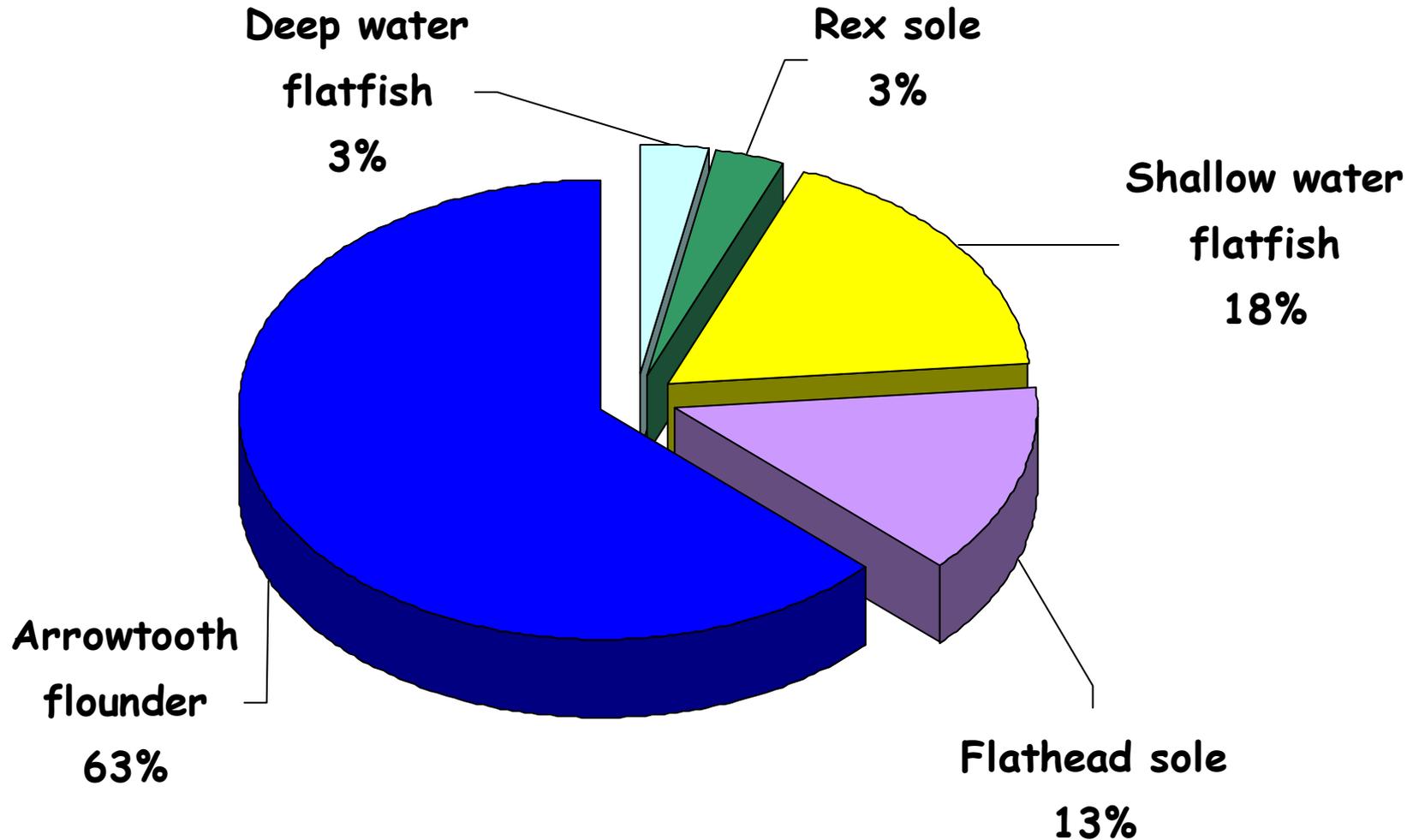
Species	2007 ABC	2008 ABC	Change
Deep water flatfish	8,707	8,903	up 196 (2%)
Rex sole	9,100	9,132	up 32 (0%)
Shallow water flatfish	51,450	60,989	up 9,539 (19%)
Flathead sole	39,110	44,735	up 5,625 (14%)
Arrowtooth flounder	184,008	226,470	up 42,462 (23%)

Deep-water ABC derived from Dover assessment (Tier 3) + others (Tier 6)

Shallow water flats: N and S rock sole Tier 4, others Tier 5

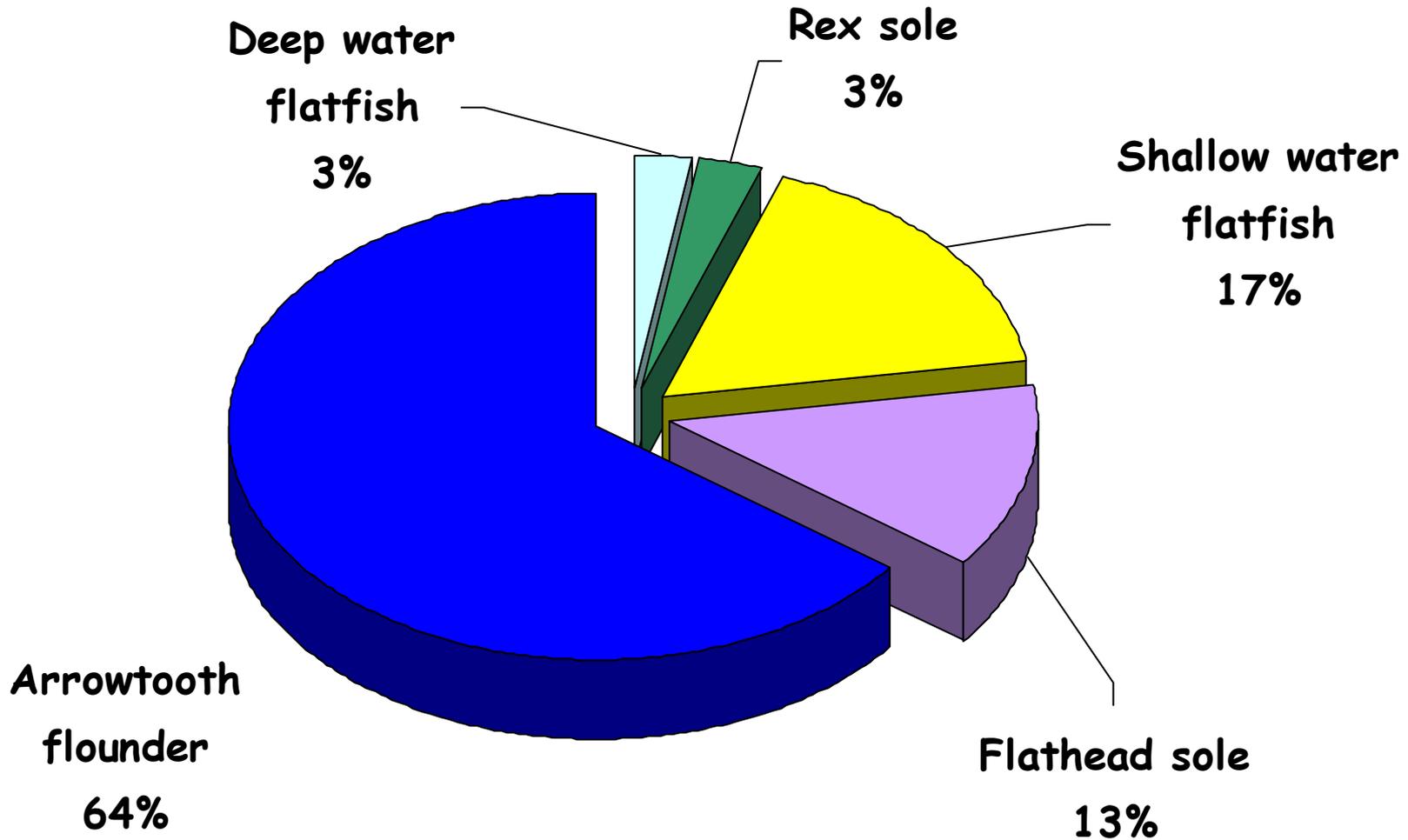
Flatfish 2007 ABC's

292,375 t combined

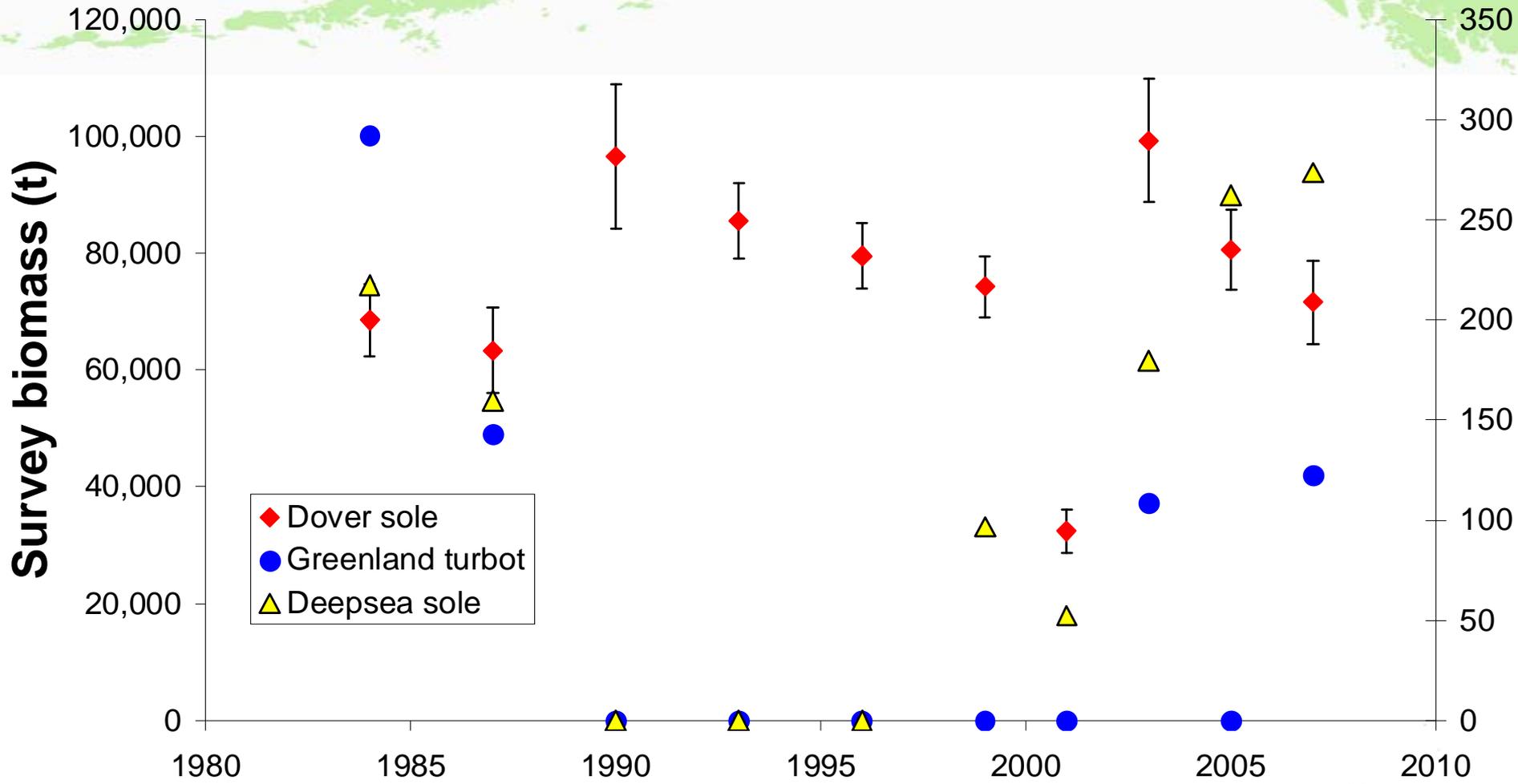


Flatfish 2008 ABC's

350,229 t combined



Deepwater flatfish



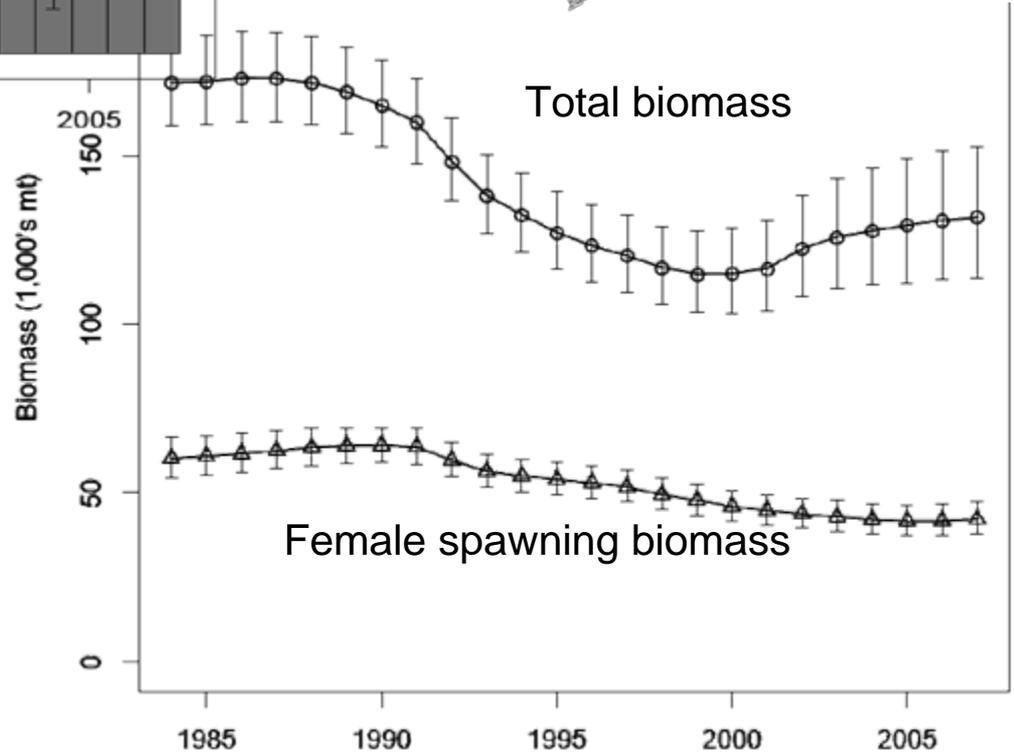
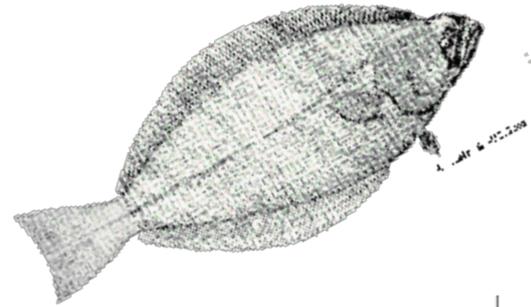
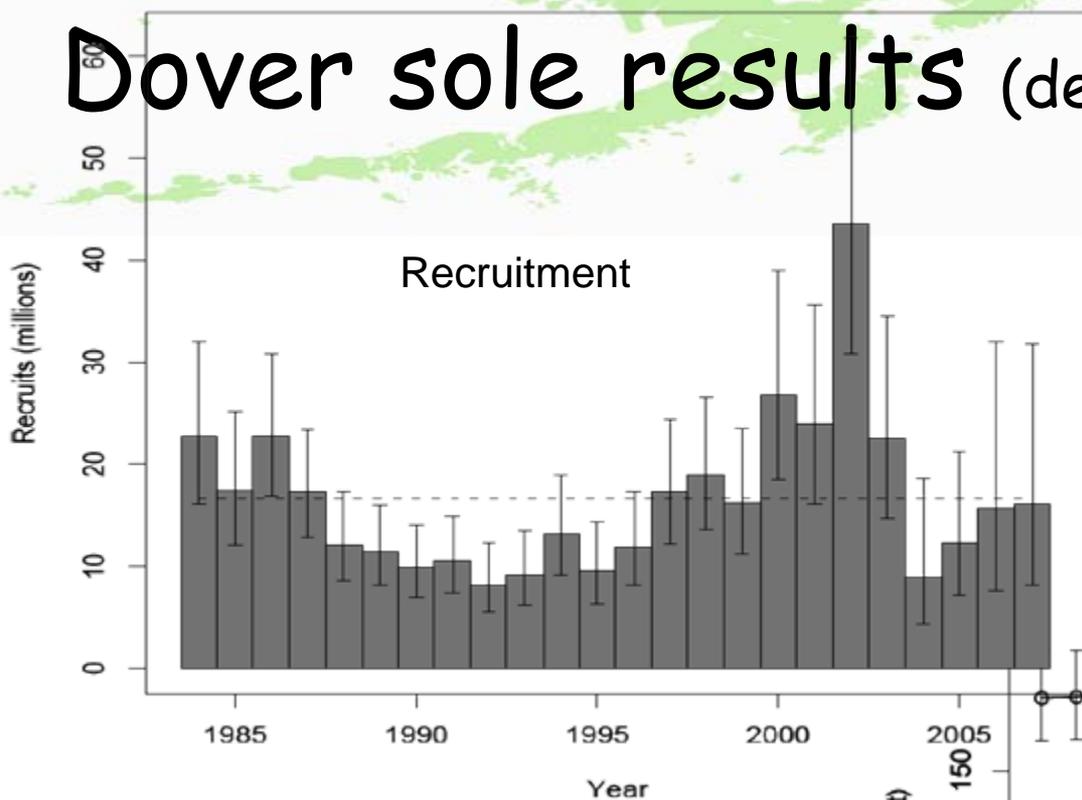
Dover sole

survey estimates
Deepsea sole

Greenland turbot



Dover sole results (deepwater flatfish)



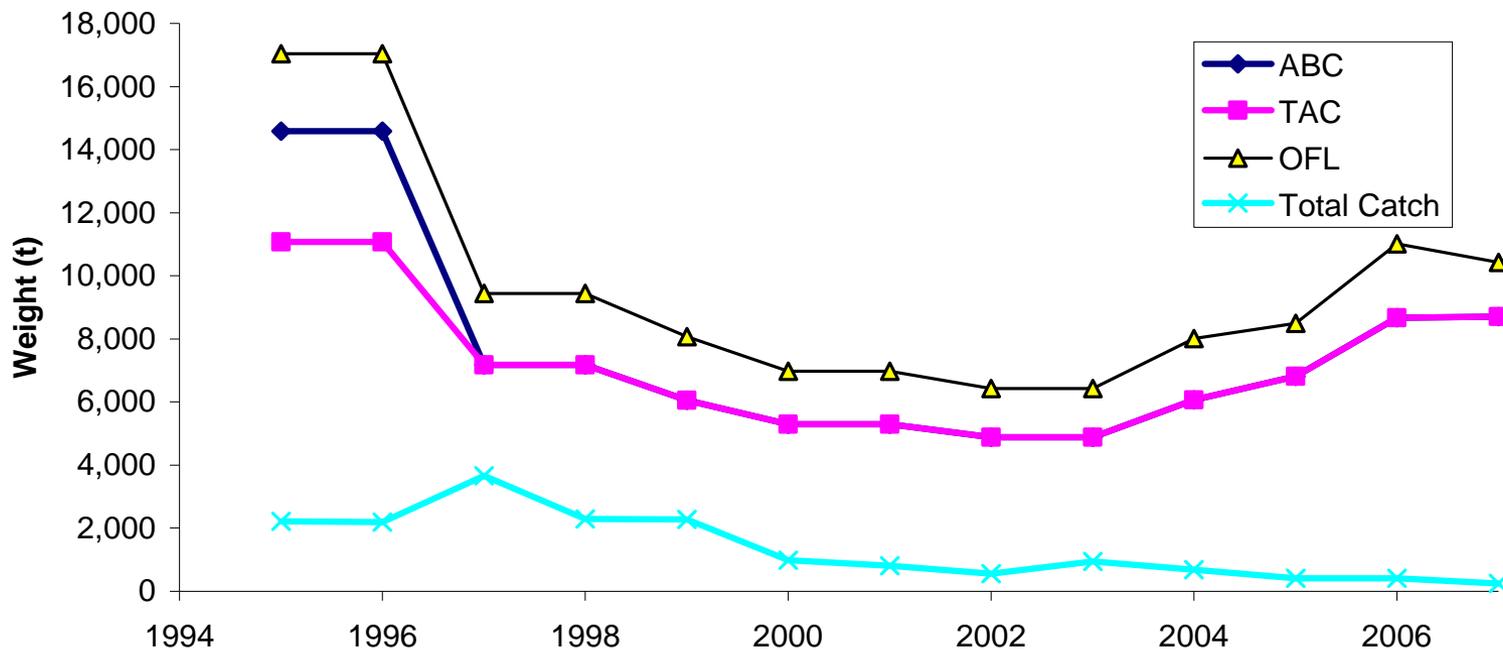
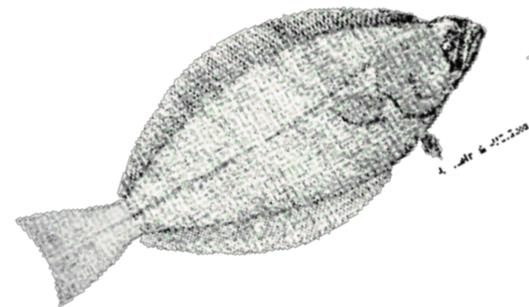
Deepwater flatfish

Dover sole
 Deepsea sole
 Greenland turbot

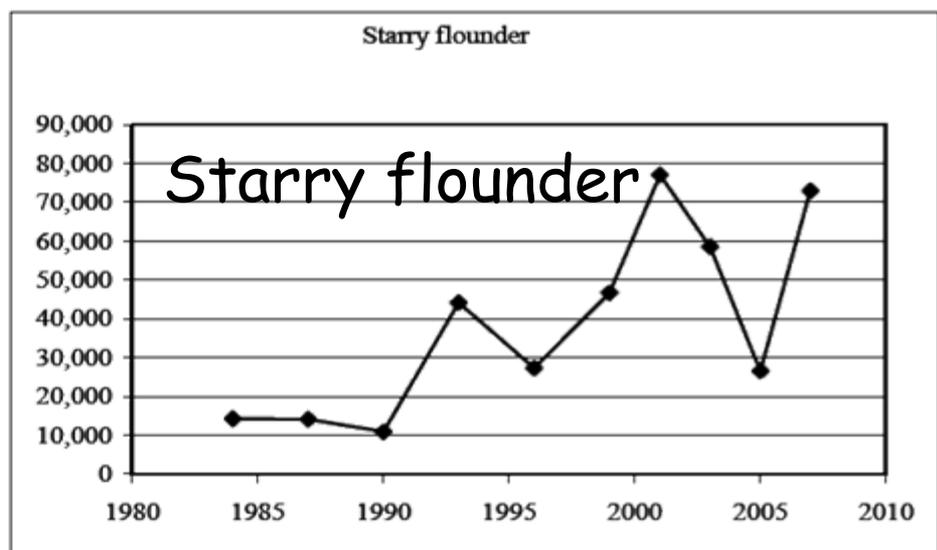
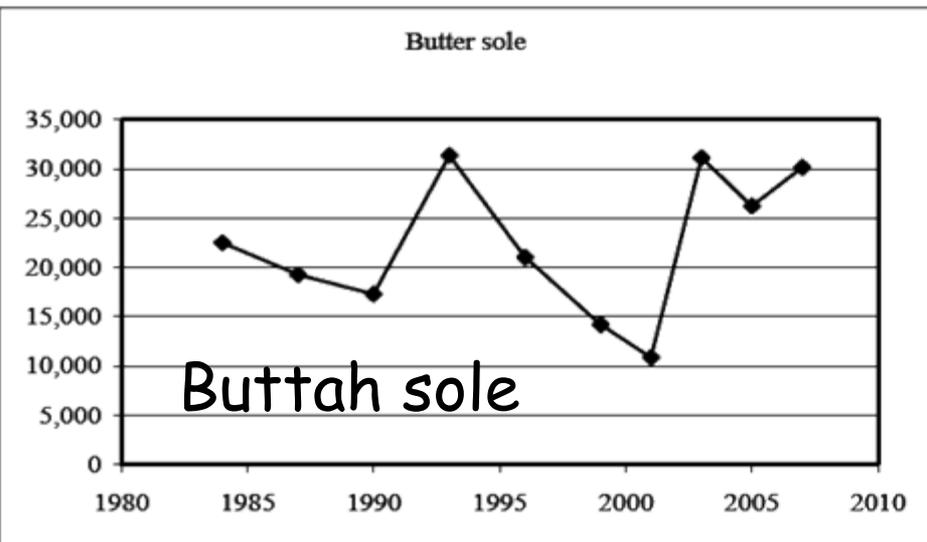
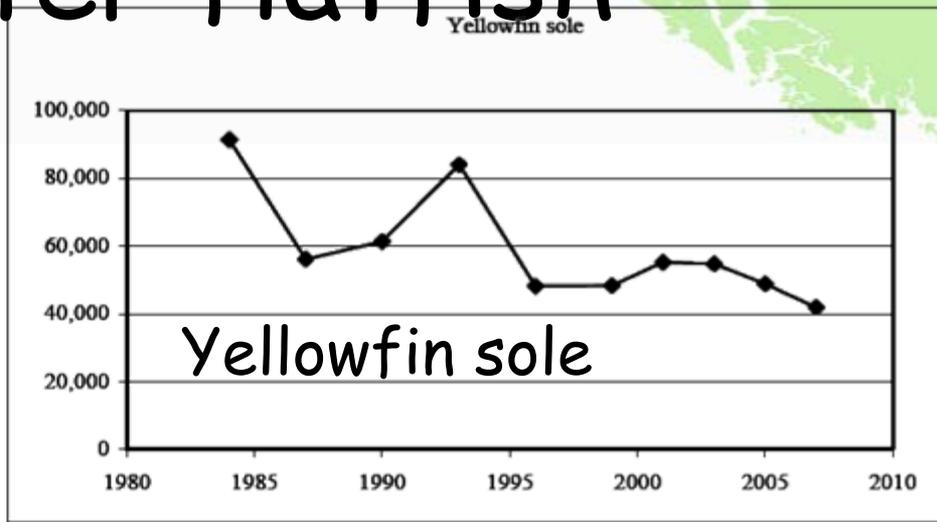
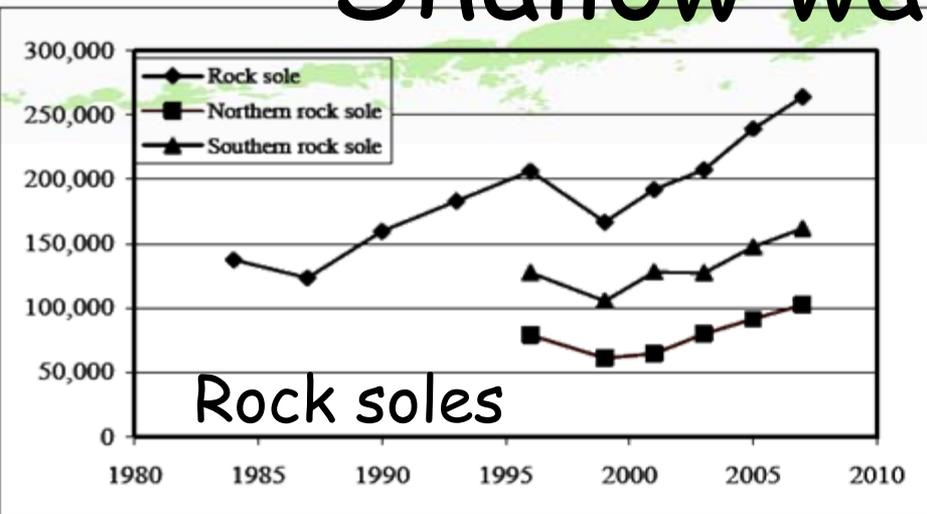
Deepwater flatfish

Biomass OFL ABC

2008	132,625	11,343	8,903
2009		11,583	9,172



Shallow water flatfish



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Shallow water flatfish

Rely on survey

Most species increased in 2007 (relative to 2005)

Except yellowfin sole and English sole

Shallow water flatfish	Biomass	OFL	ABC
2008	436,590	74,364	60,989
2009		74,364	60,989

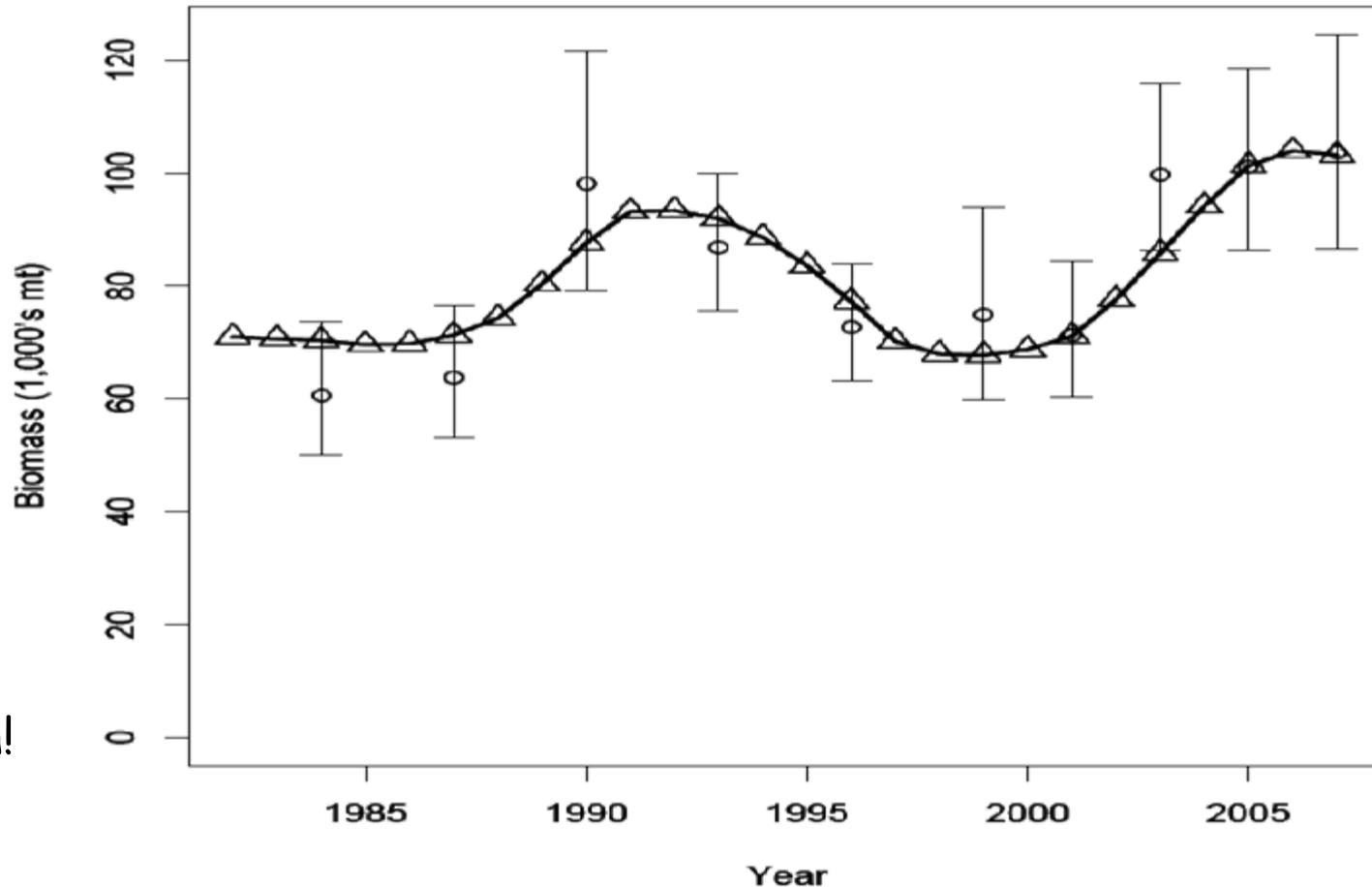
	ABC	OFL
Northern Rock sole	17,169	20,230
Southern Rock sole	21,967	25,671
Rock sole subtotal	39,135	45,901
Yellowfin sole	5,293	6,894
Butter sole	3,819	4,974
Starry flounder	9,244	12,040
English sole	1,555	2,025
Sand sole	401	522
Alaska plaice	1,541	2,008
Total	60,989	74,364

GOA Rex Sole

Age-structured model (since 2004), $M=0.17$

In 2005 adopted Tier 5 w/ model biomass

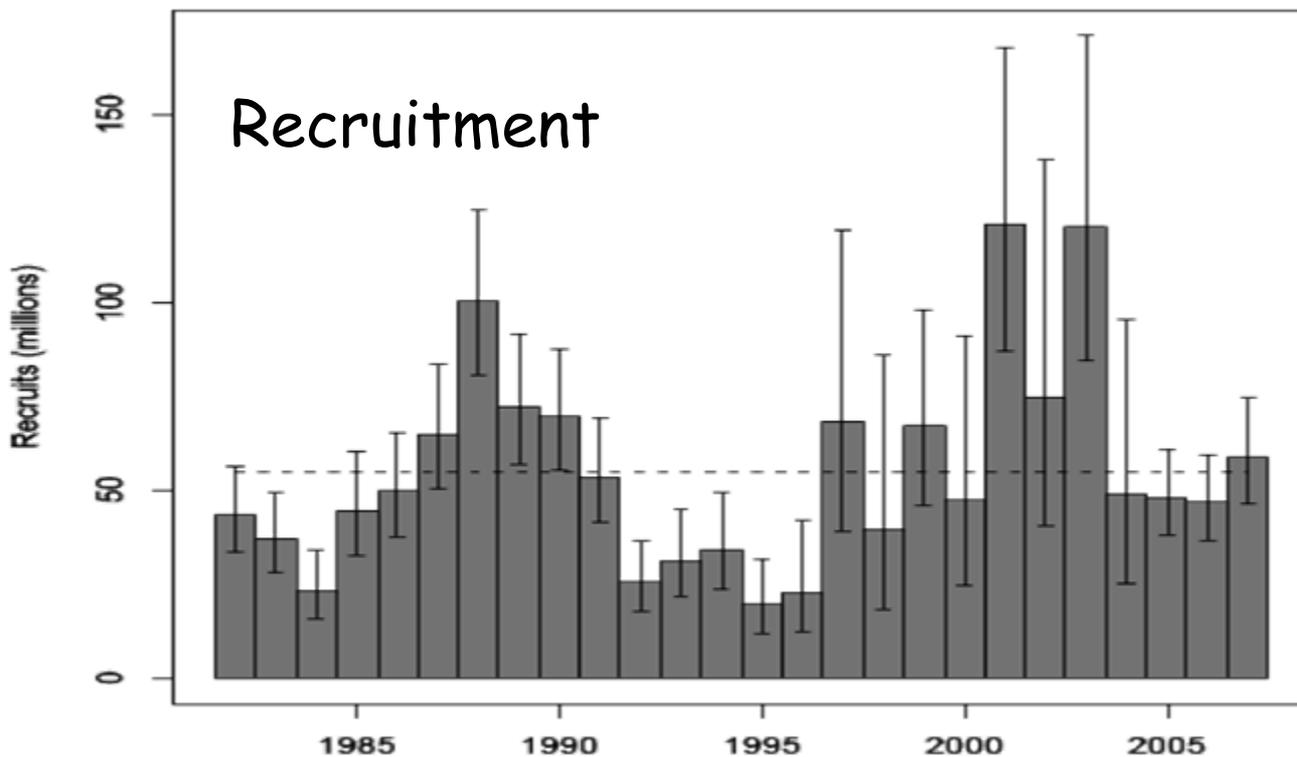
Due to young age at maturity and old selectivity estimates
2007 survey biomass highest observed



Up for MSC
Certification!

Rex sole ABC/OFL

Rex sole	Biomass	OFL	ABC
2008	82,801	11,933	9,132
2009		11,065	8,468



Tier 5 (model based)

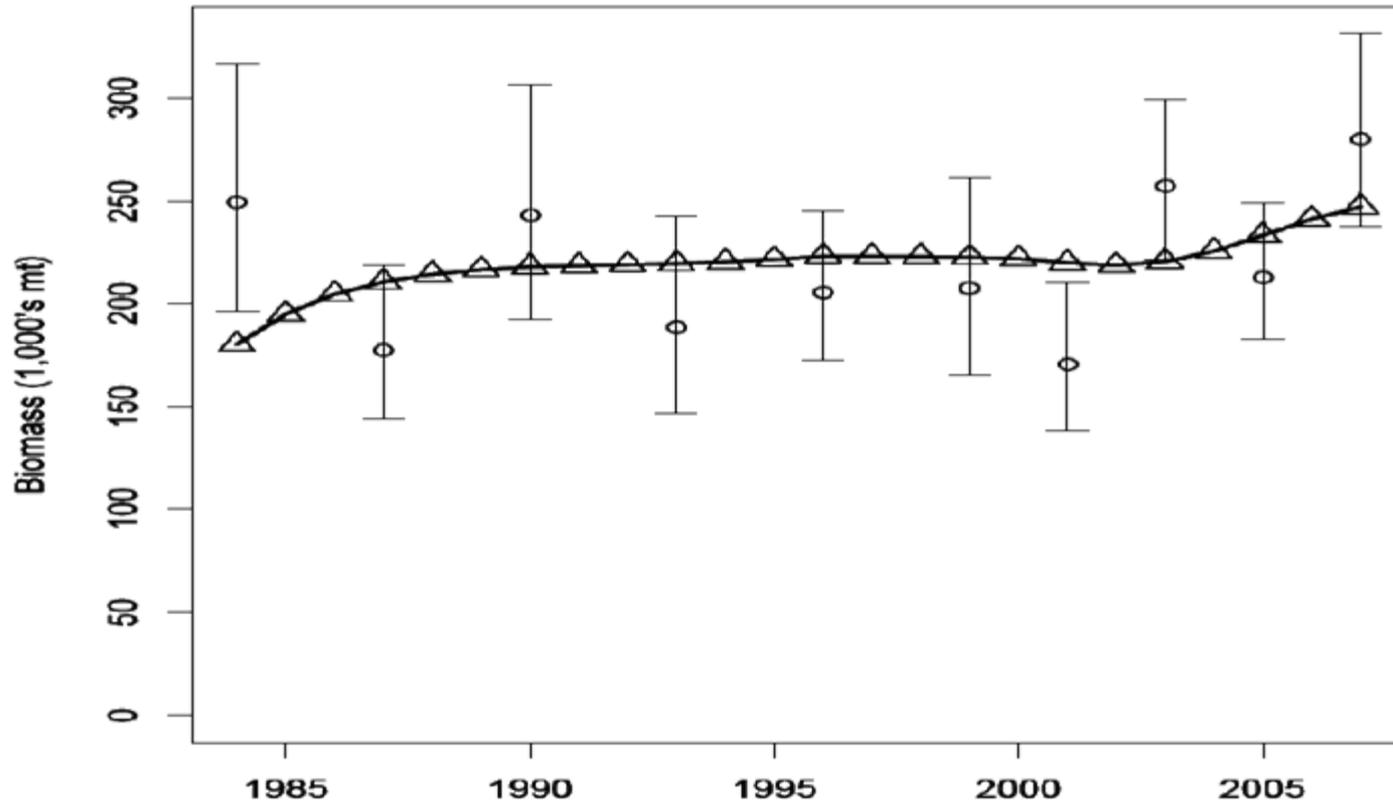
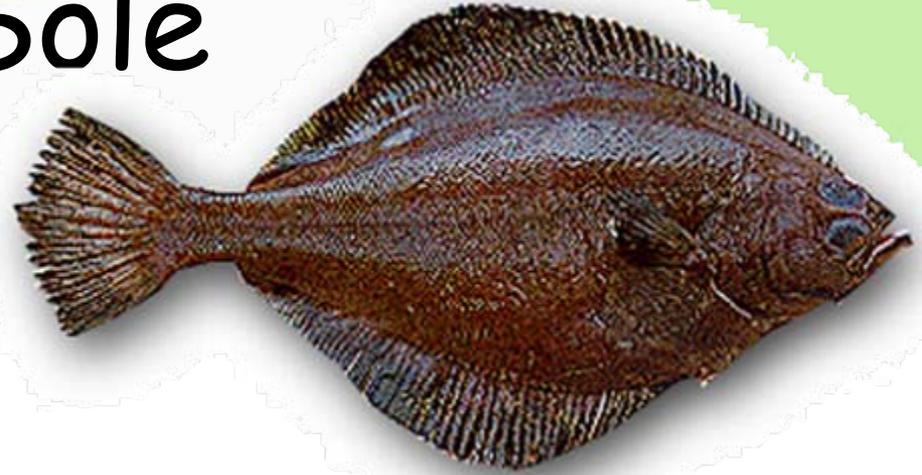
Team requested spatial evaluation of fishery length data to better understand selectivity pattern

GOA Flathead Sole

Age-structured model

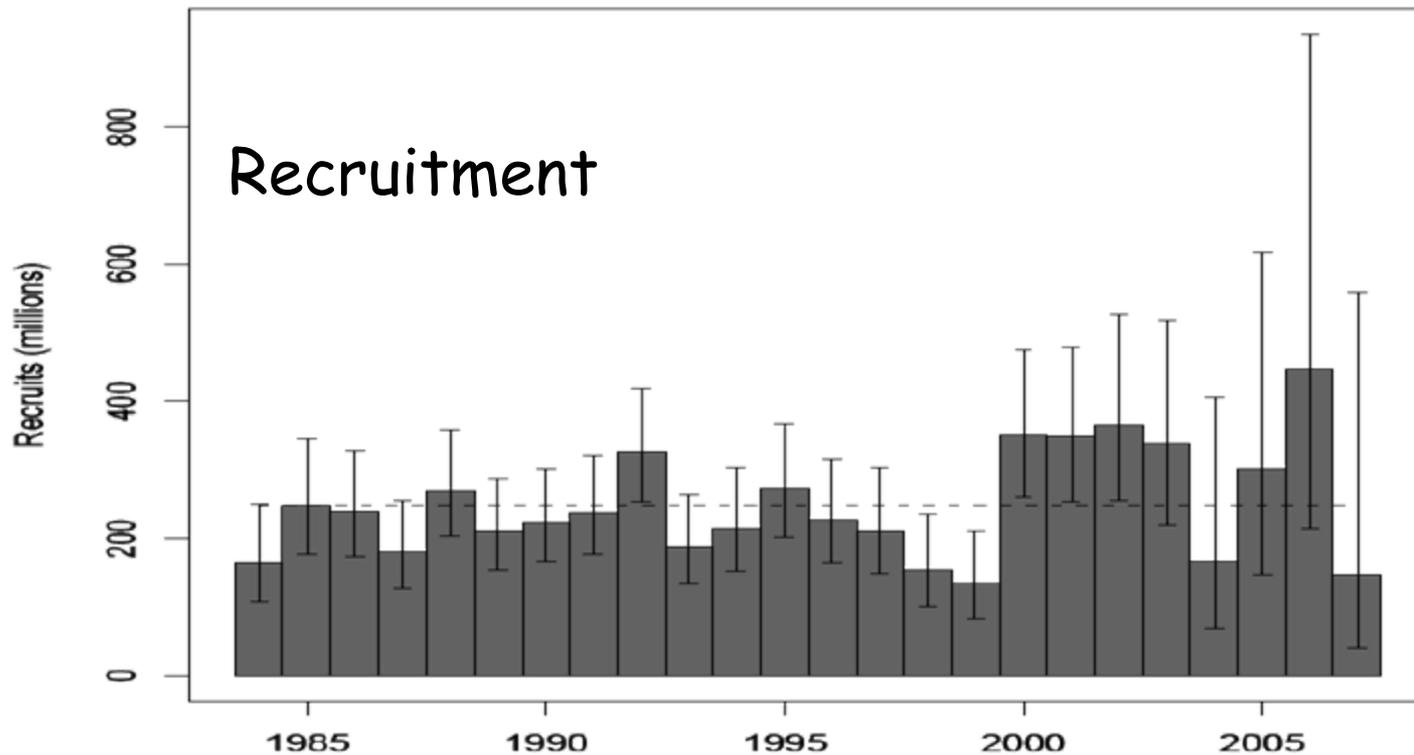
32% increase in survey biomass

2007 survey biomass also highest observed



Flathead sole ABC/OFL

	Biomass	OFL	ABC
2008	324,197	55,787	44,735
2009		57,962	46,505



2006
recruitment
highly
uncertain

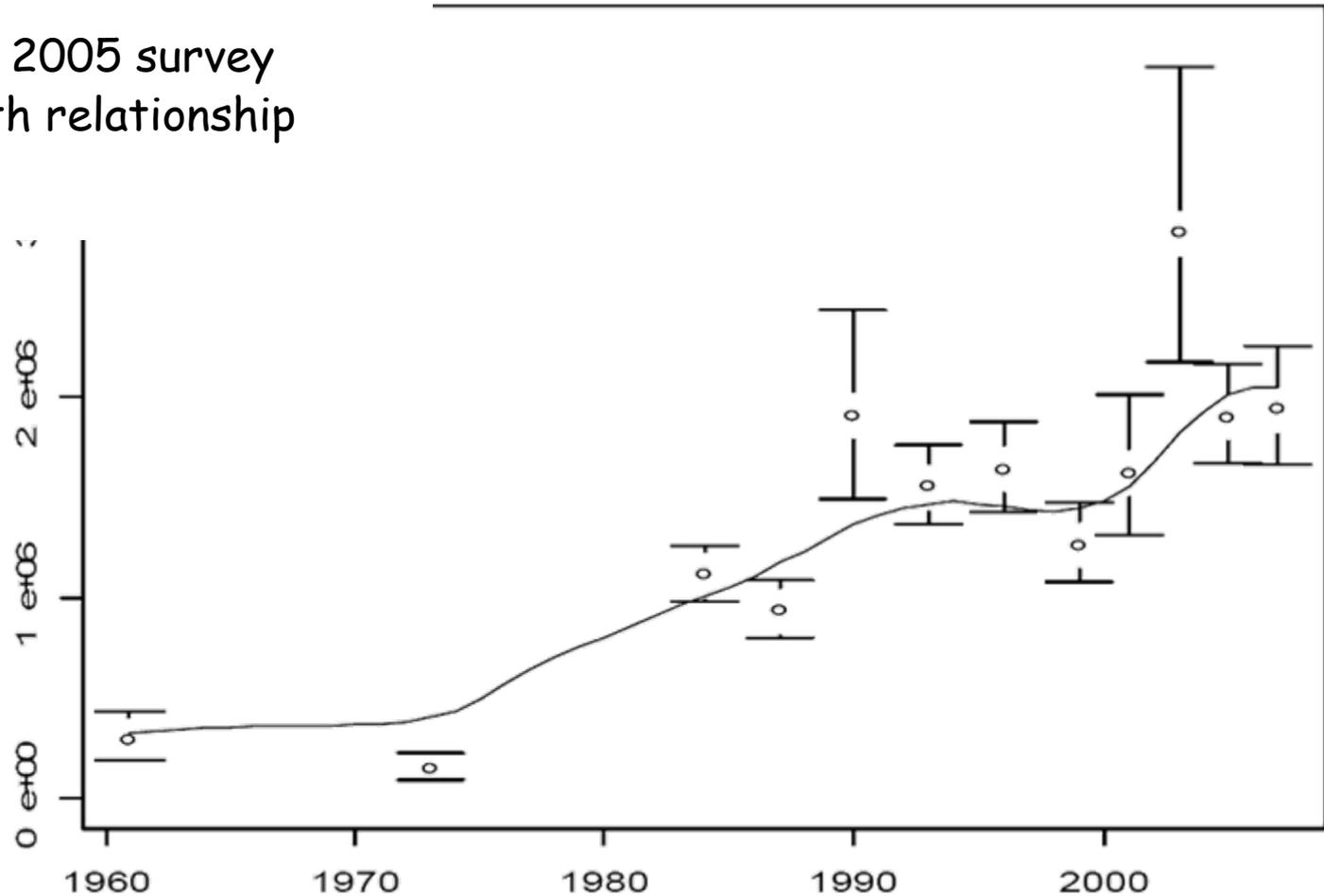
GOA Arrowtooth flounder

Same age/sex structured model

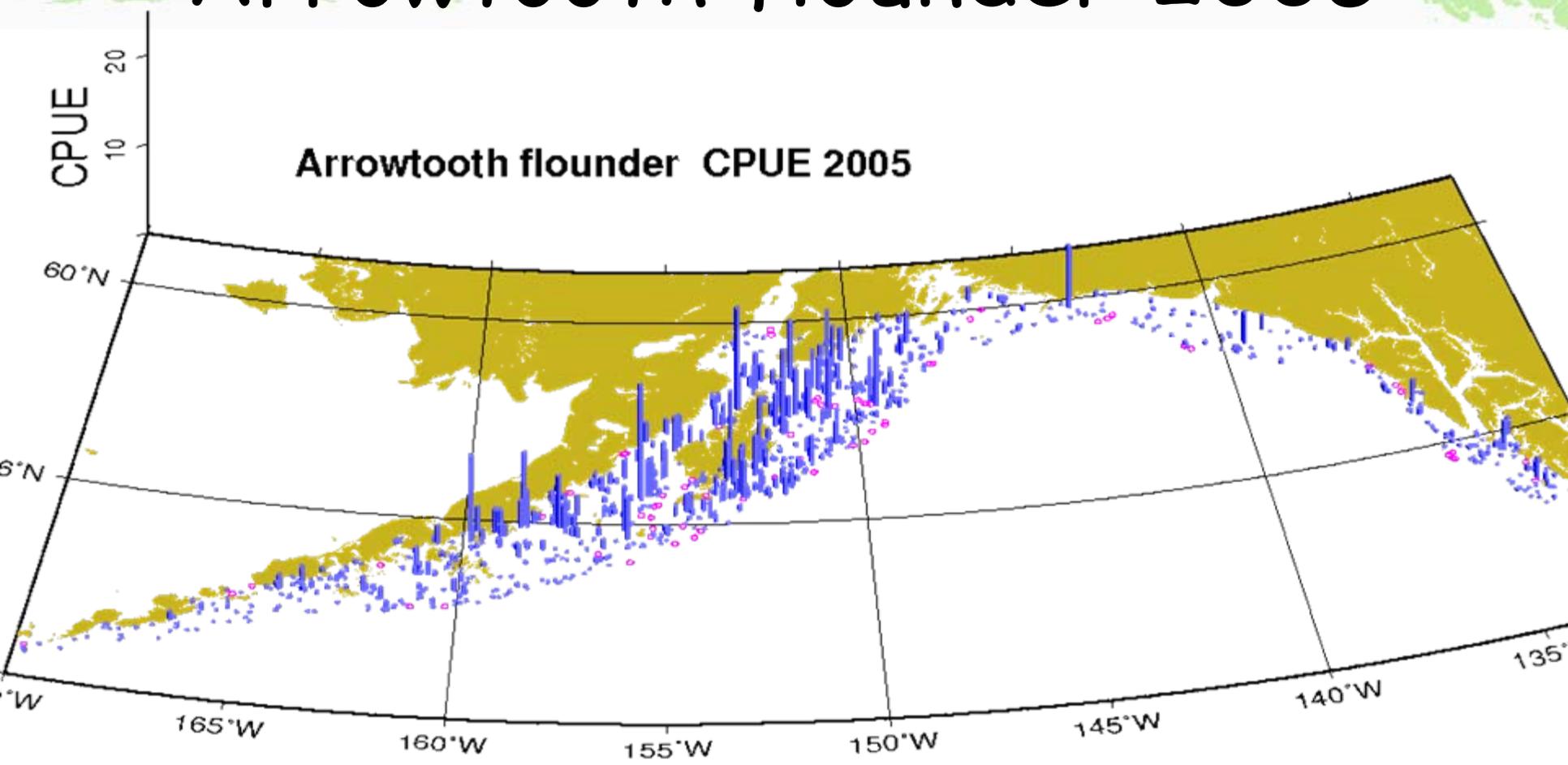
2007 survey biomass and size composition

Age data from 2005 survey

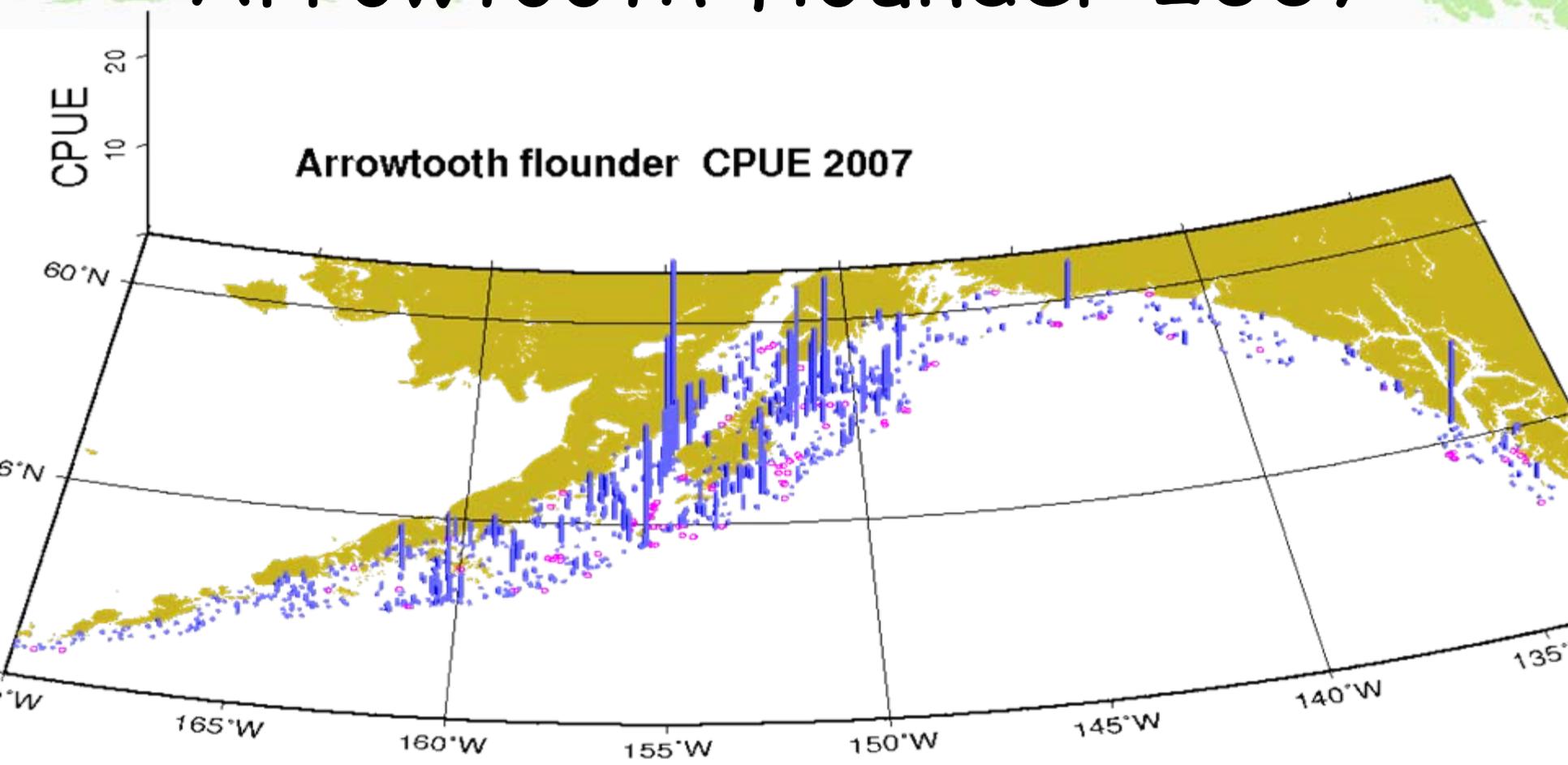
Updated growth relationship



Arrowtooth flounder 2005



Arrowtooth flounder 2007

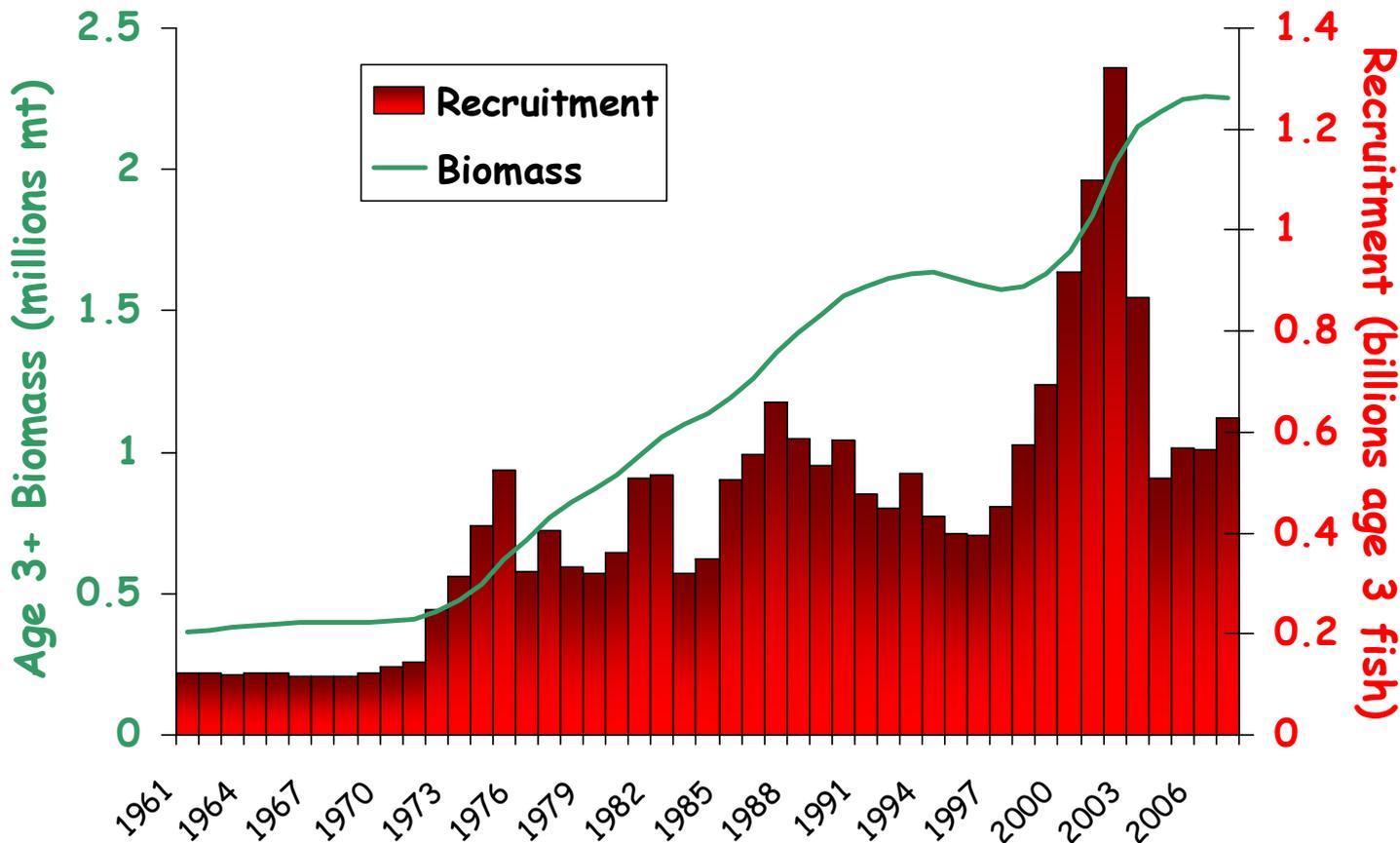


GOA Arrowtooth flounder ABC/OFL

Tier 3a
 2008 ABC up
 23% due
 mainly to
 change in
 somatic
 growth

Bulk of GOA
 ABC increase

Year	Biomass	OFL	ABC
2008	2,244,870	266,914	226,470
2009		269,237	228,405



Rockfish overview

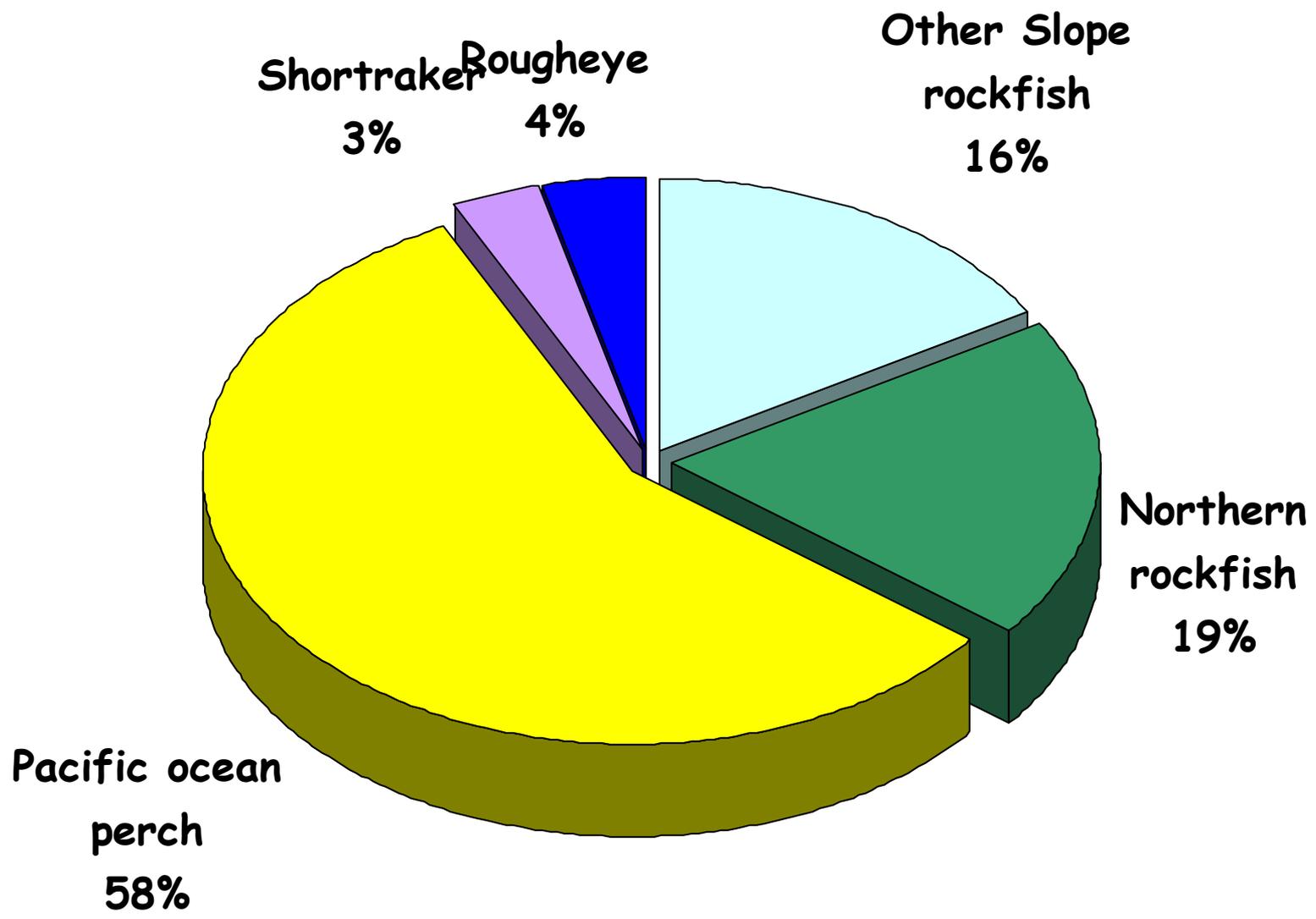
Species	2007 ABC	2008 ABC	Change	
Other Slope rockfish	4,154	4,297	up 143	(3%)
Northern rockfish	4,938	4,549	down 389	(8%)
Pacific ocean perch	14,636	14,999	up 363	(2%)
Shortraker/ rougheye	1,831	2,184	up 353	(19%)
Shortraker	843	898	up 55	(7%)
Rougheye	988	1,286	up 298	(30%)
Pelagic shelf rockfish	5,542	5,227	down 315	(6%)
Demersal Shelf Rockfish	410	382	down 28	(7%)
Thornyhead rockfish	2,209	1,910	down 299	(14%)
Total	33,720	33,548	down 172	(1%)

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Rockfish pilot project update—valuable for
considerations in future assessments

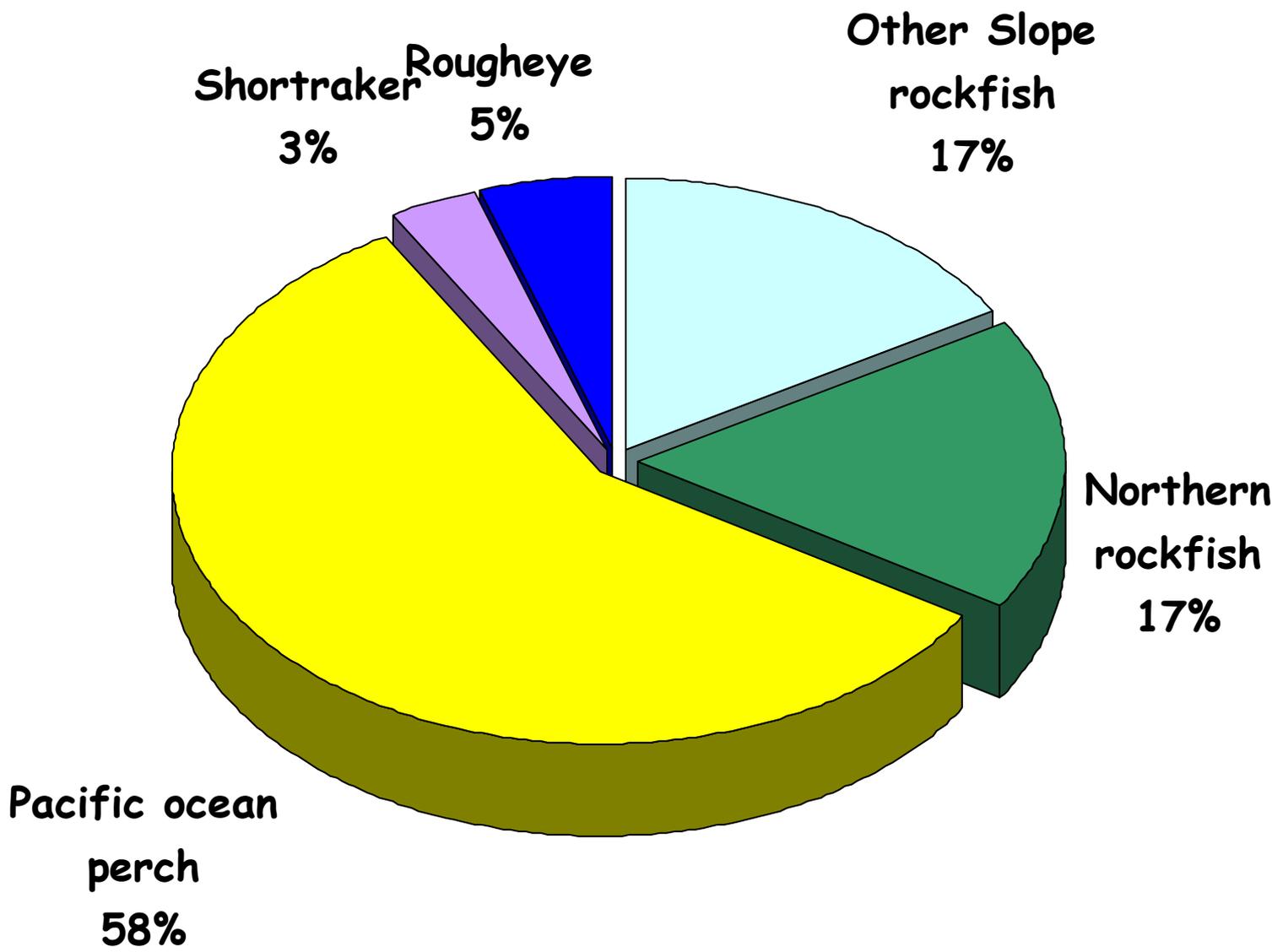
Slope Rockfish 2007 ABC's

25,560 tons total



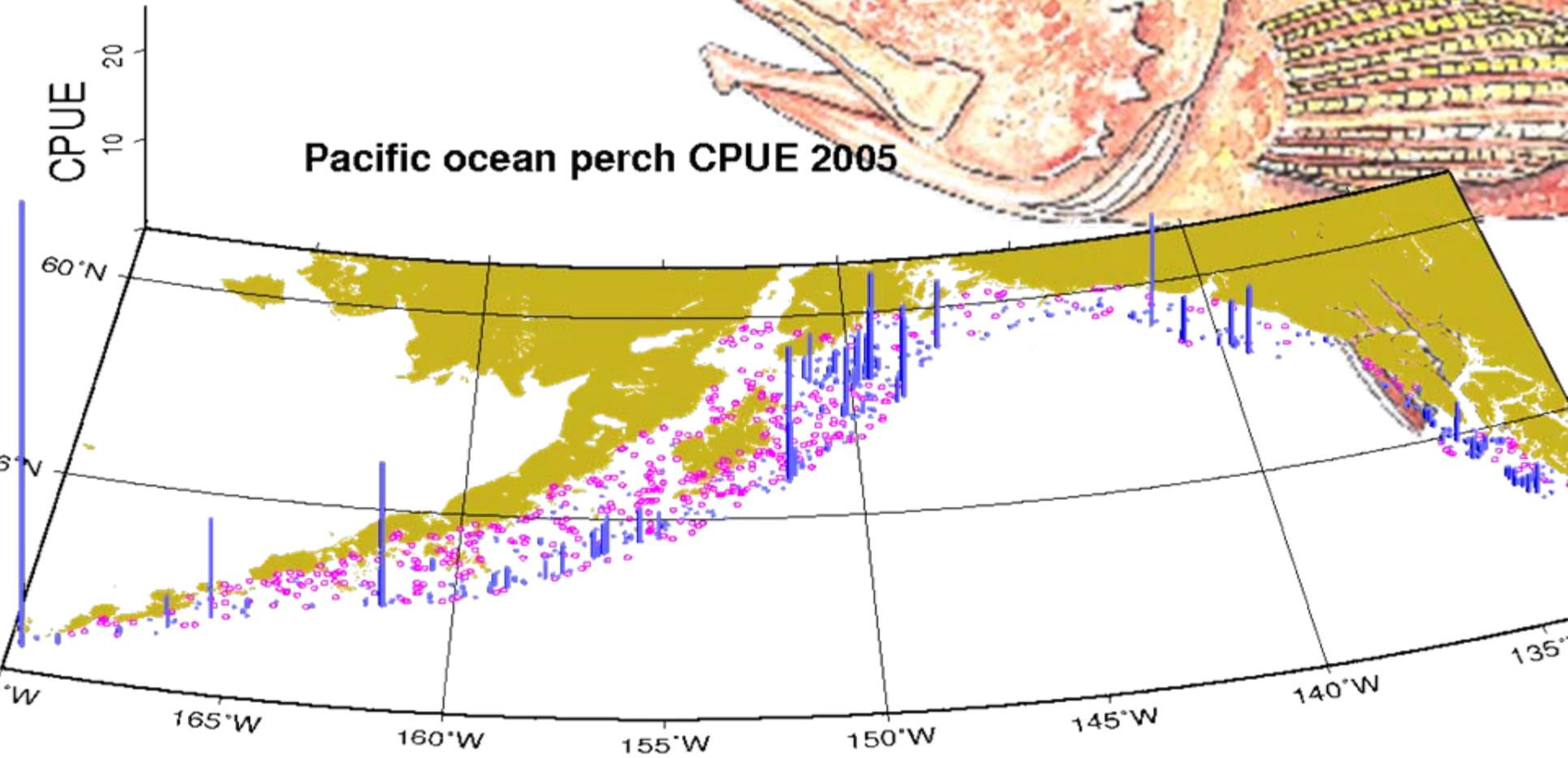
Slope Rockfish 2008 ABC's

26,029 tons total



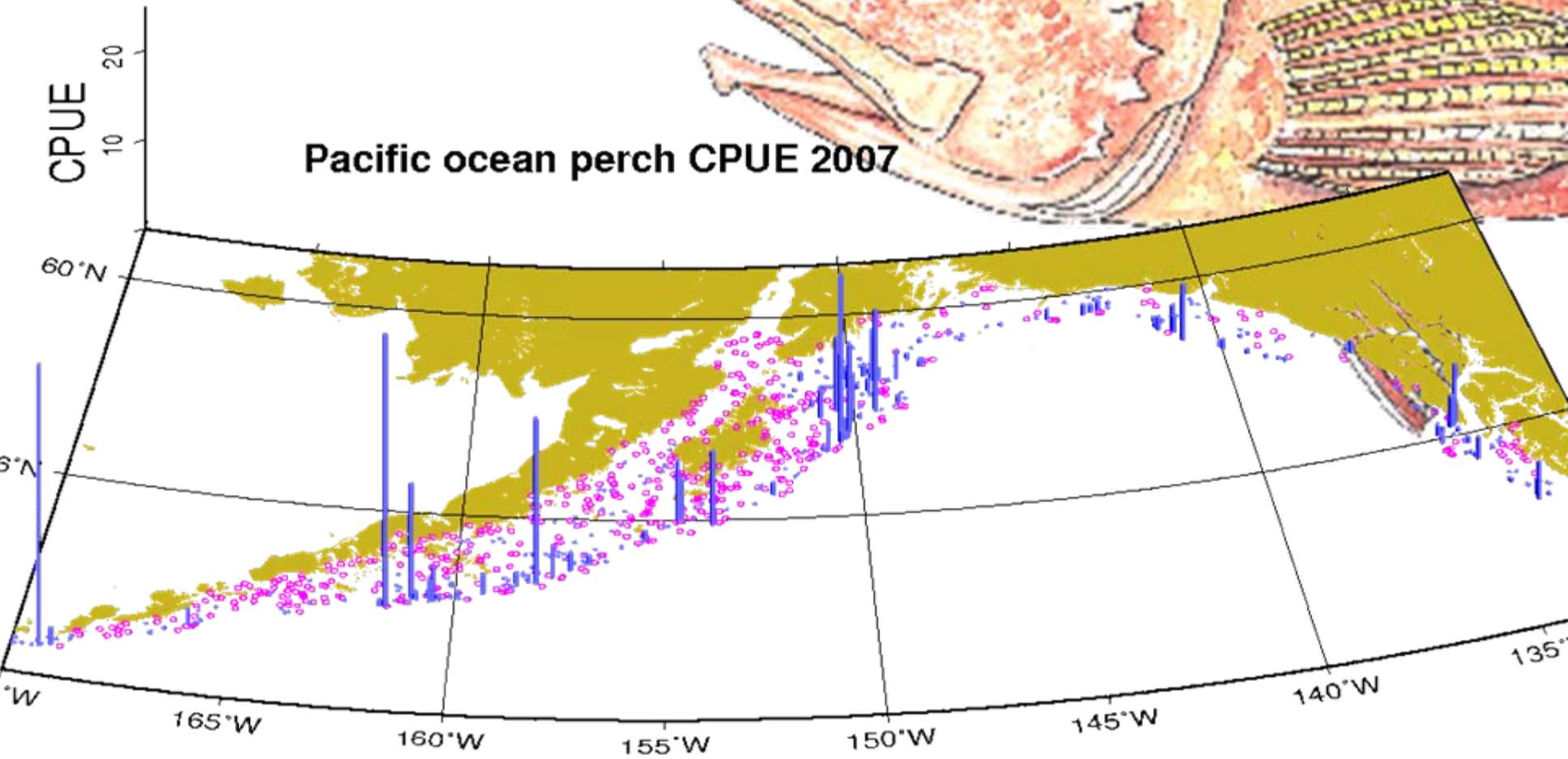
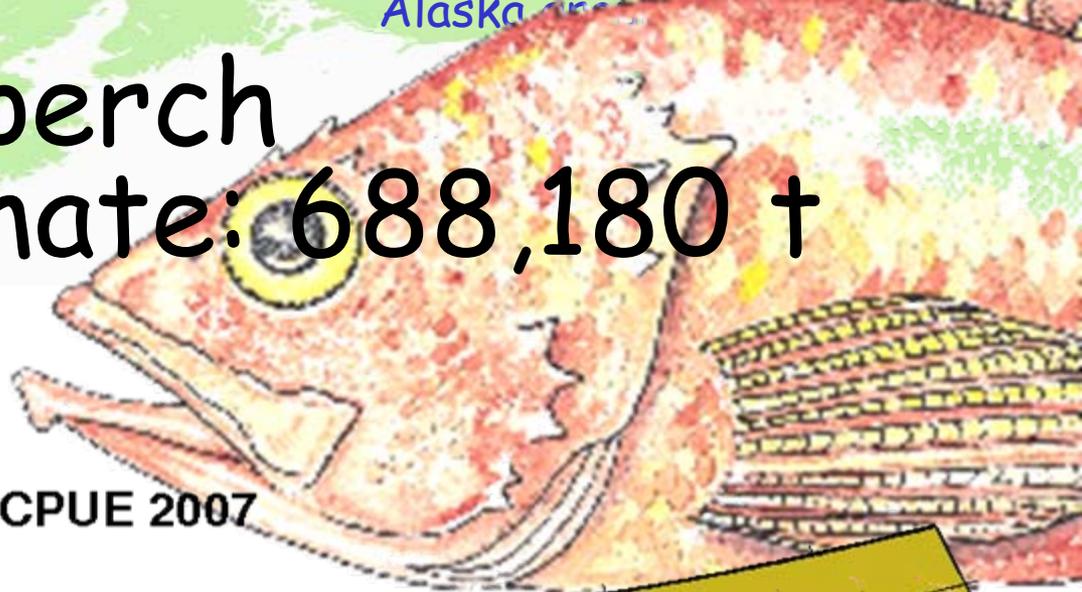
Pacific ocean perch

2005 estimate: 766,418 t

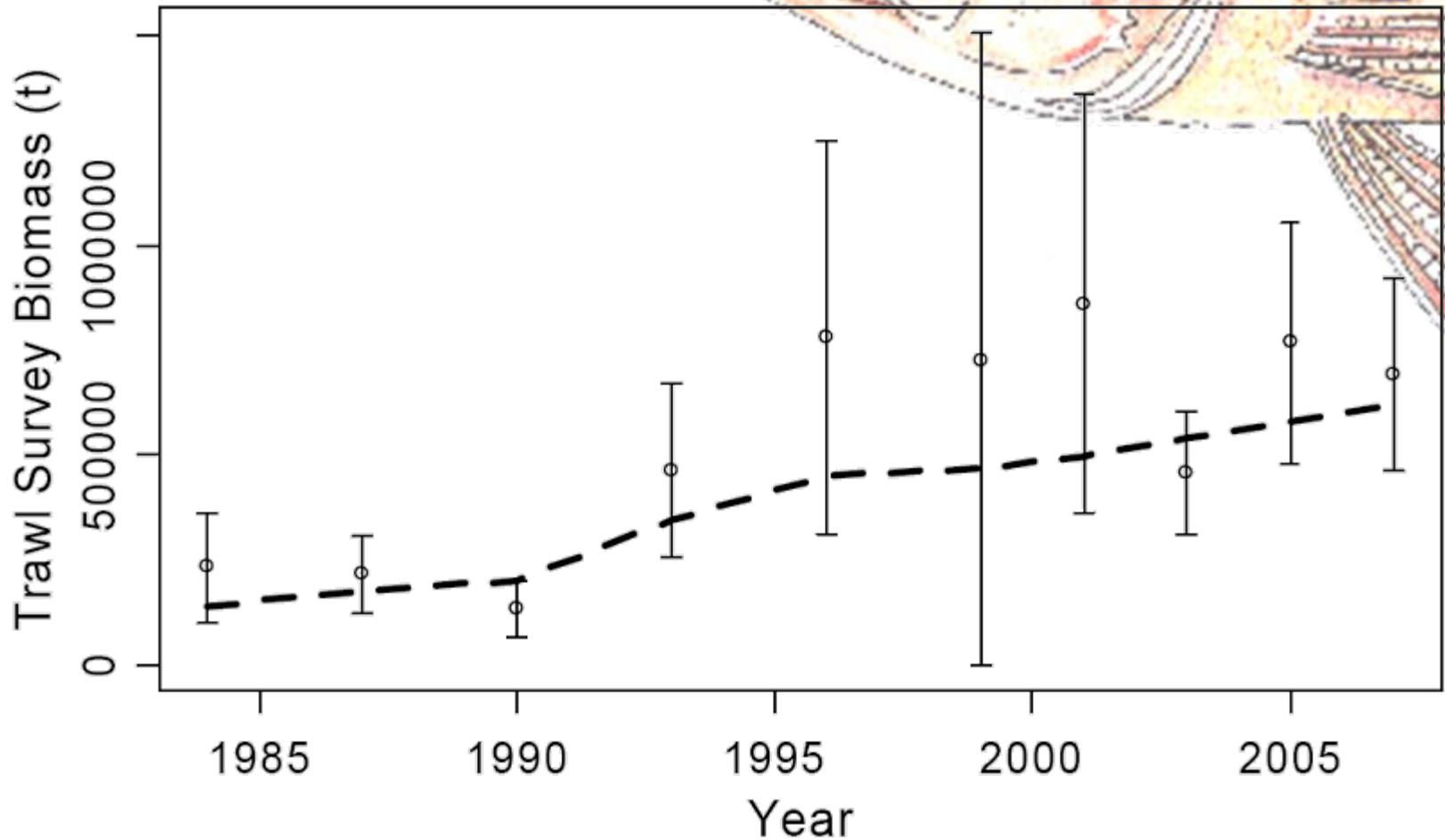


Pacific ocean perch

2007 estimate: 688,180 †

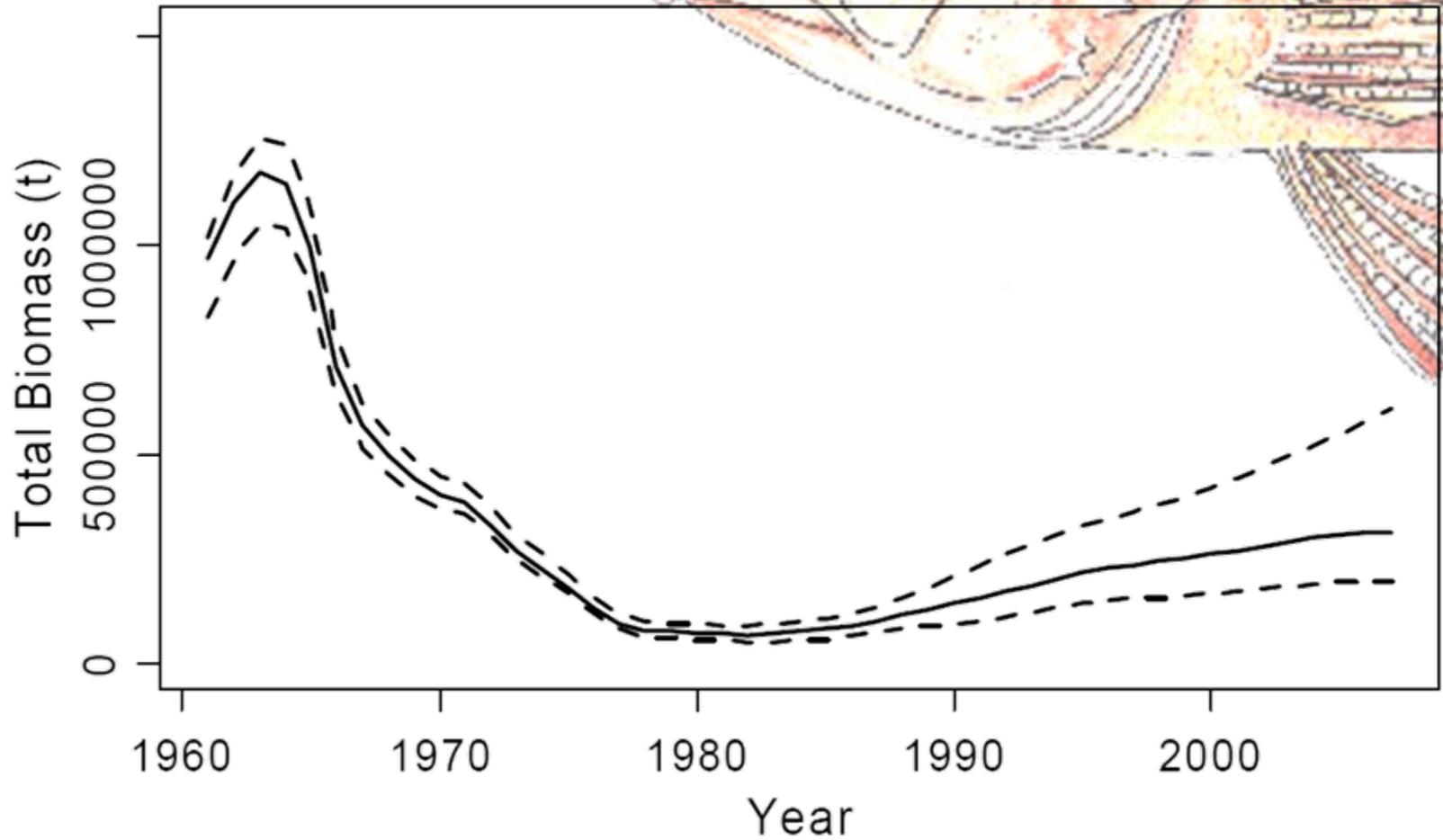
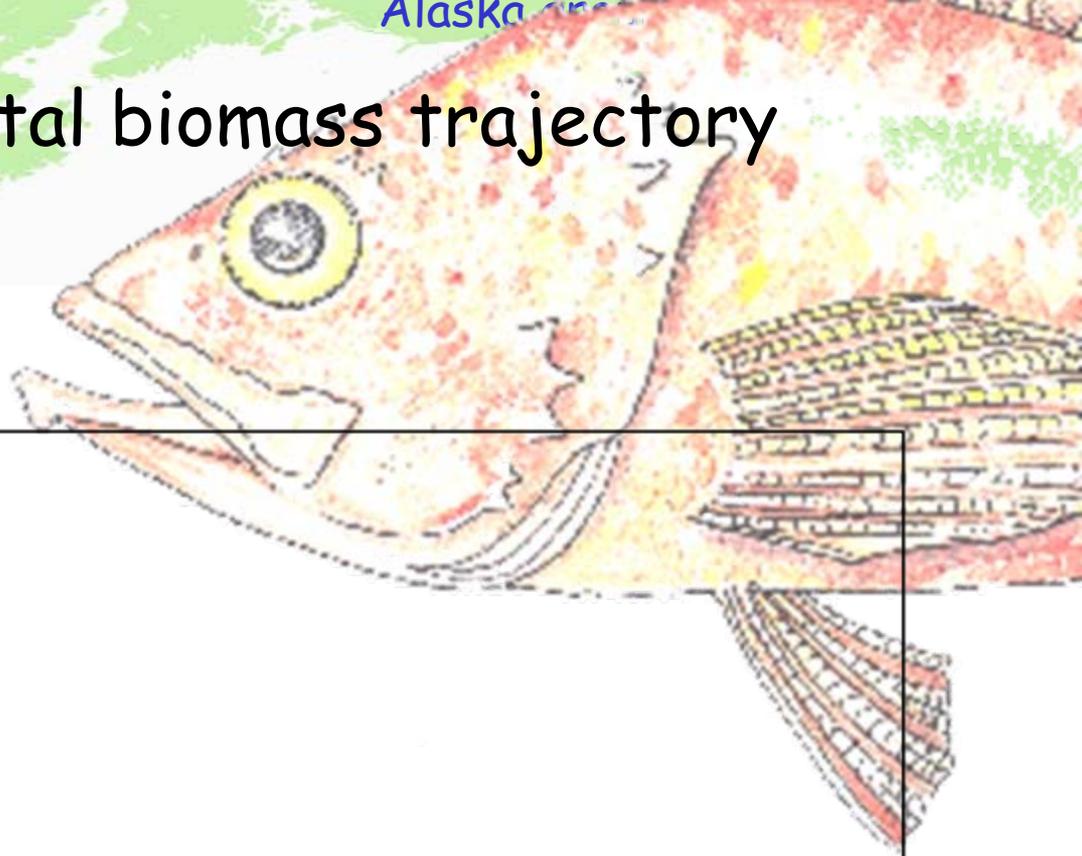


Pacific ocean perch biomass estimates



Pacific ocean perch total biomass trajectory

Alaska



Pacific ocean perch ABC/OFL

	Biomass	OFL	ABC
2008	317,511	17,807	14,999
2009		17,893	15,072

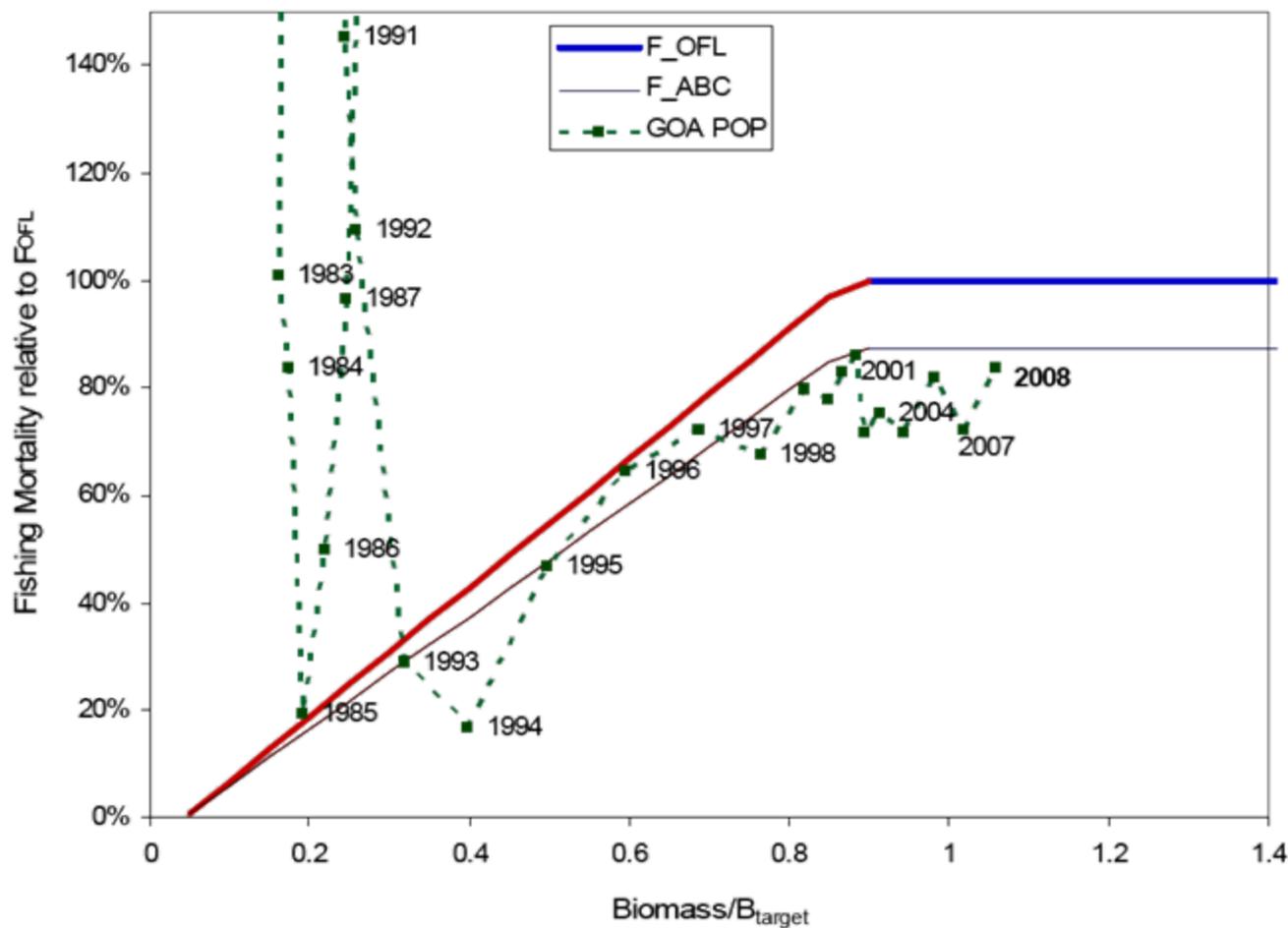
Tier 3a

Survey $q=2.13$

West: 3,686 (-11%)

Cntrl: 8,185 (+10%)

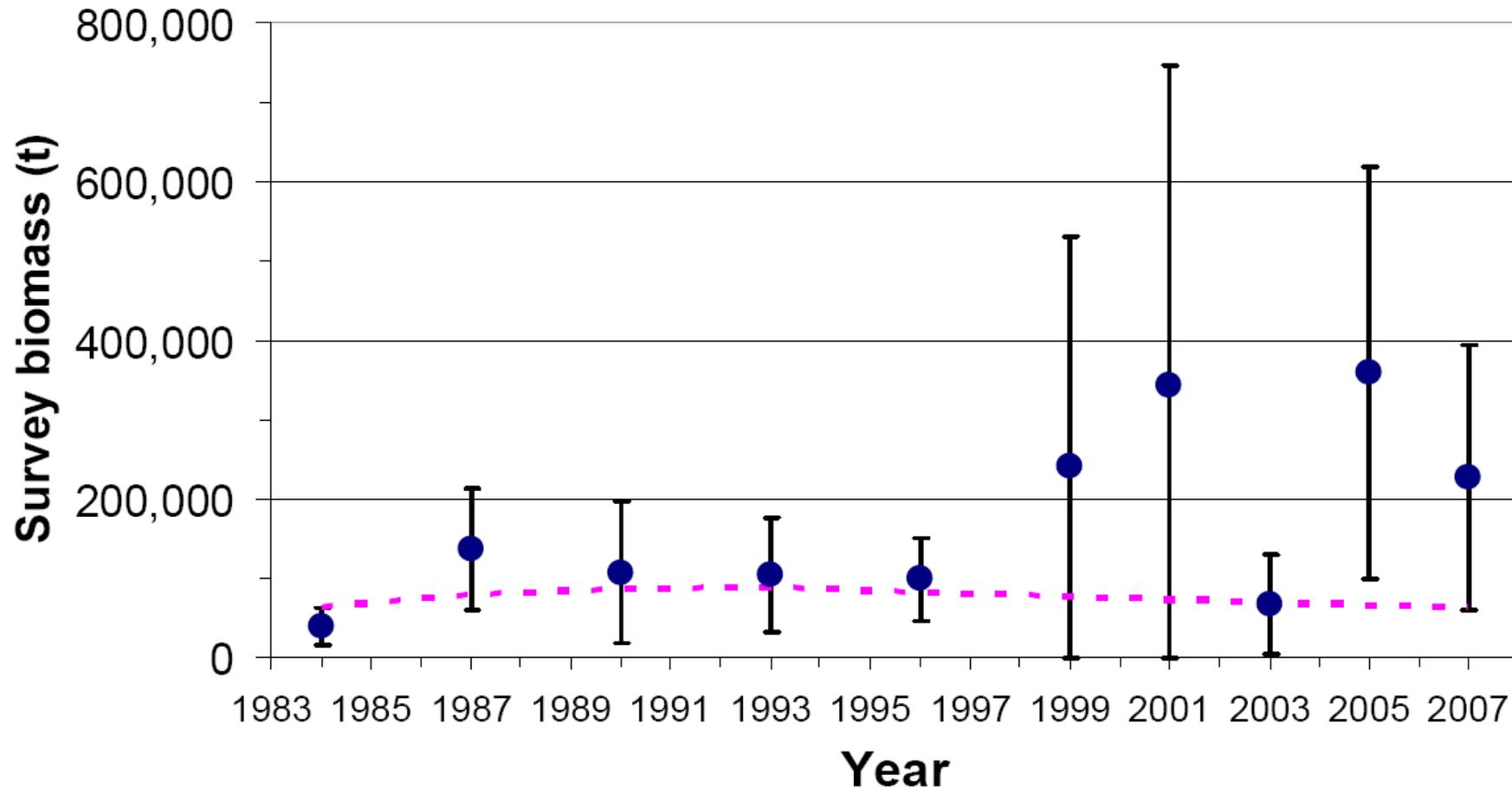
East: 3,128 (+16%)



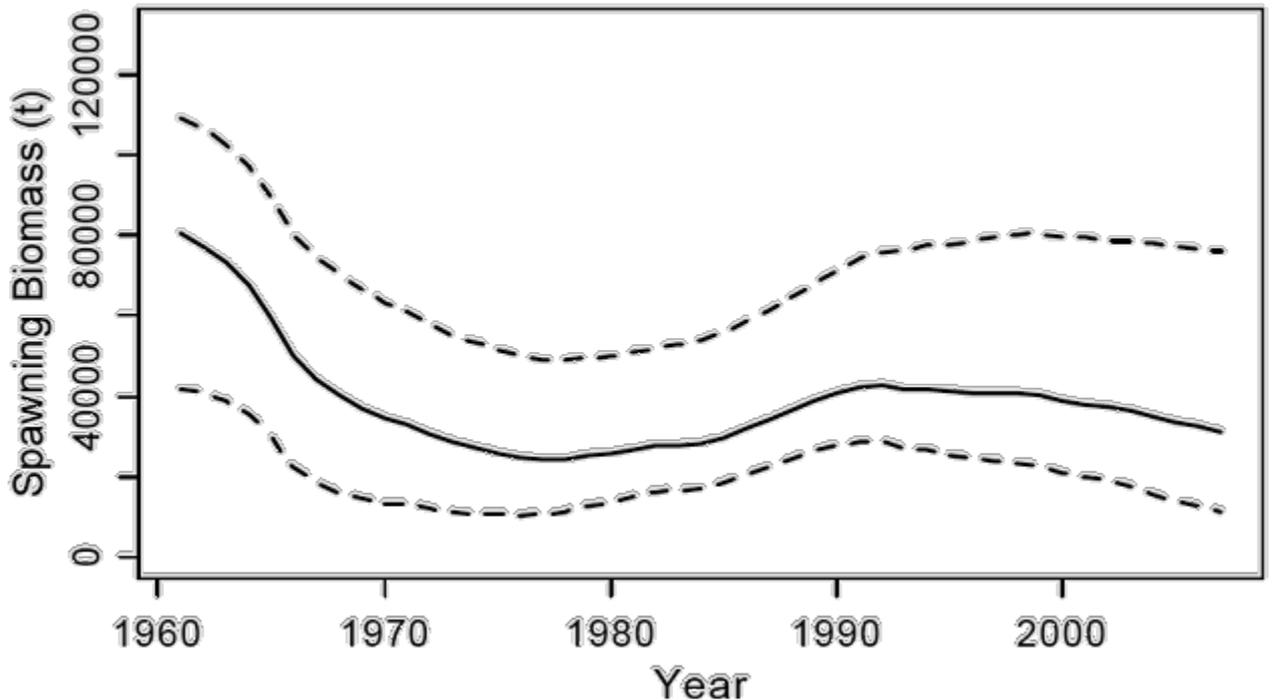
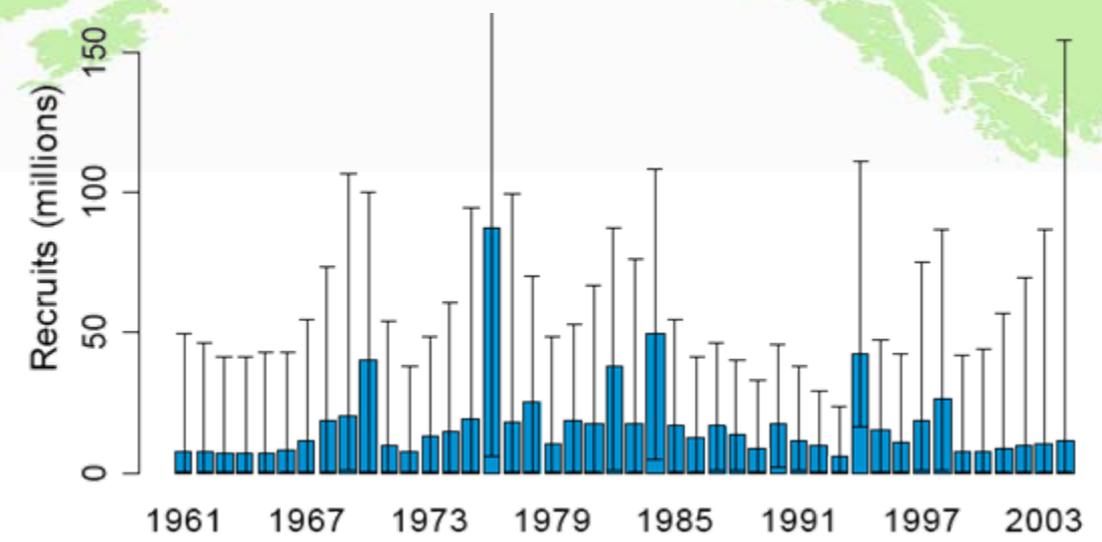
Northern rockfish



- ◆ Model revised based on workshop and CIE
- ◆ Female spawning biomass declining slightly at 29,000 t, above B40% (22,300 t)



Northern rockfish



Northern rockfish

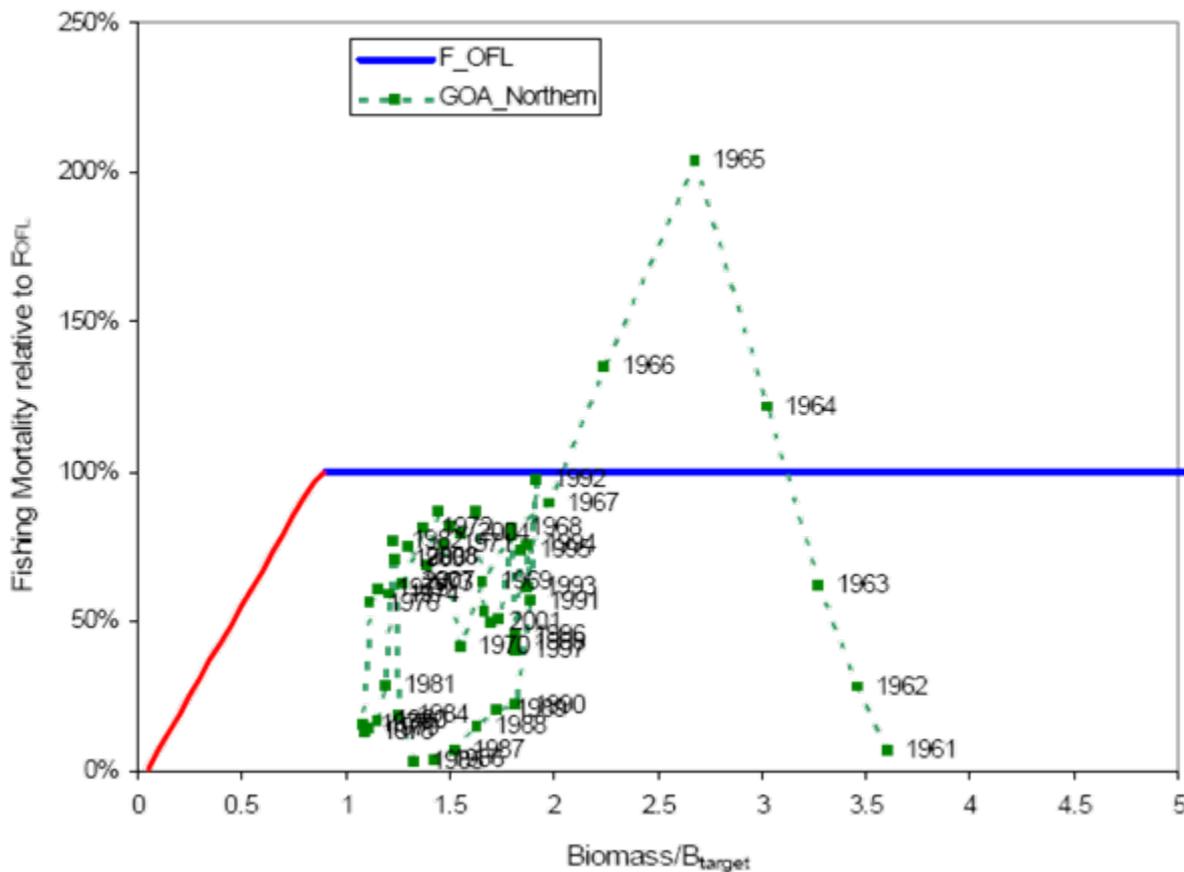
Tier 3a

Apportionment	West	Central	EGOA
Old method	36%	65%	0%
Include shallow strata	47%	53%	0%

Research:

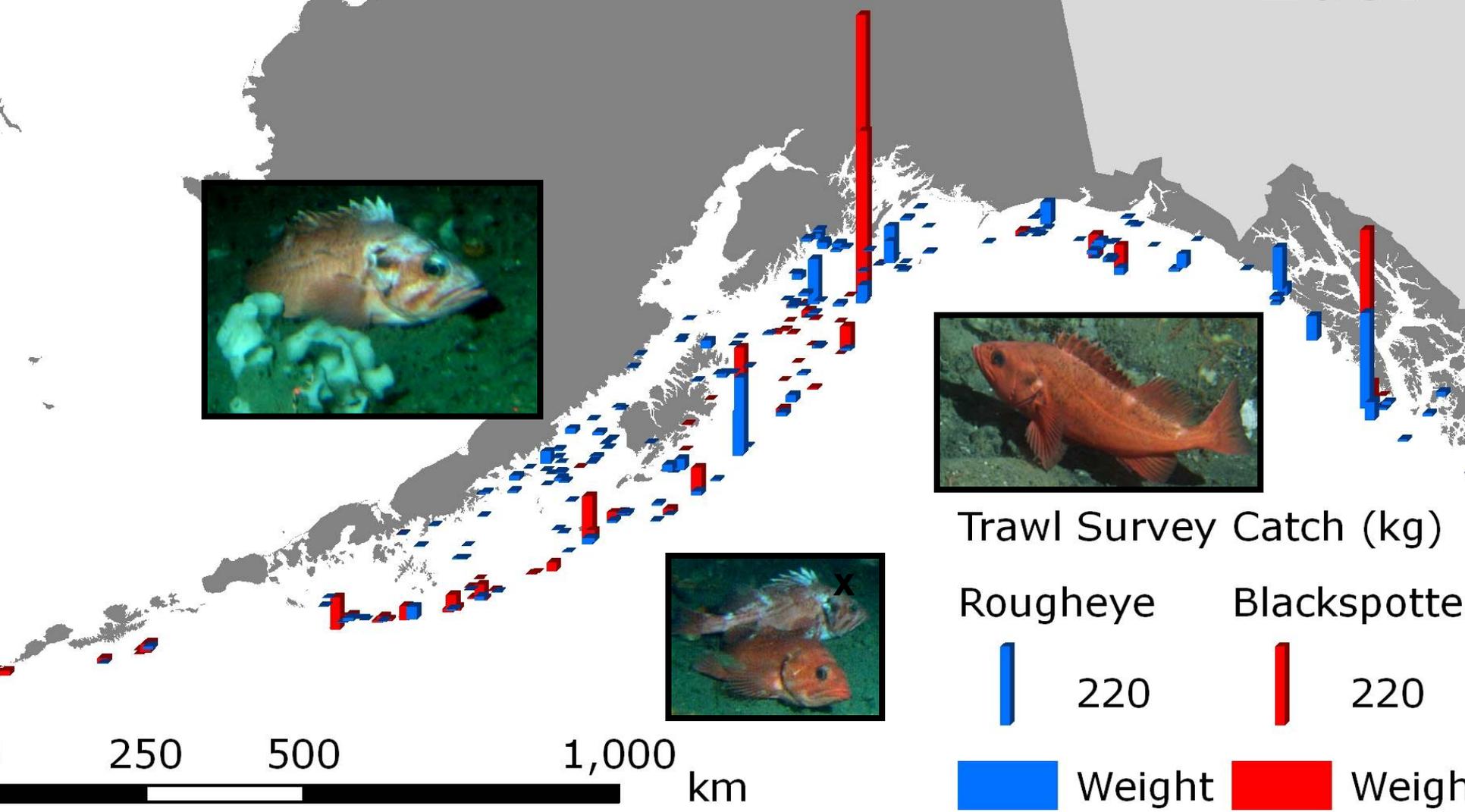
- Input sample sizes
- Trawl/untrawlable
- Alternative surveys

	Biomass	OFL	ABC
2008	93,391	5,430	4,550
2009		5,120	4,350



Rougheye vs Blackspotted

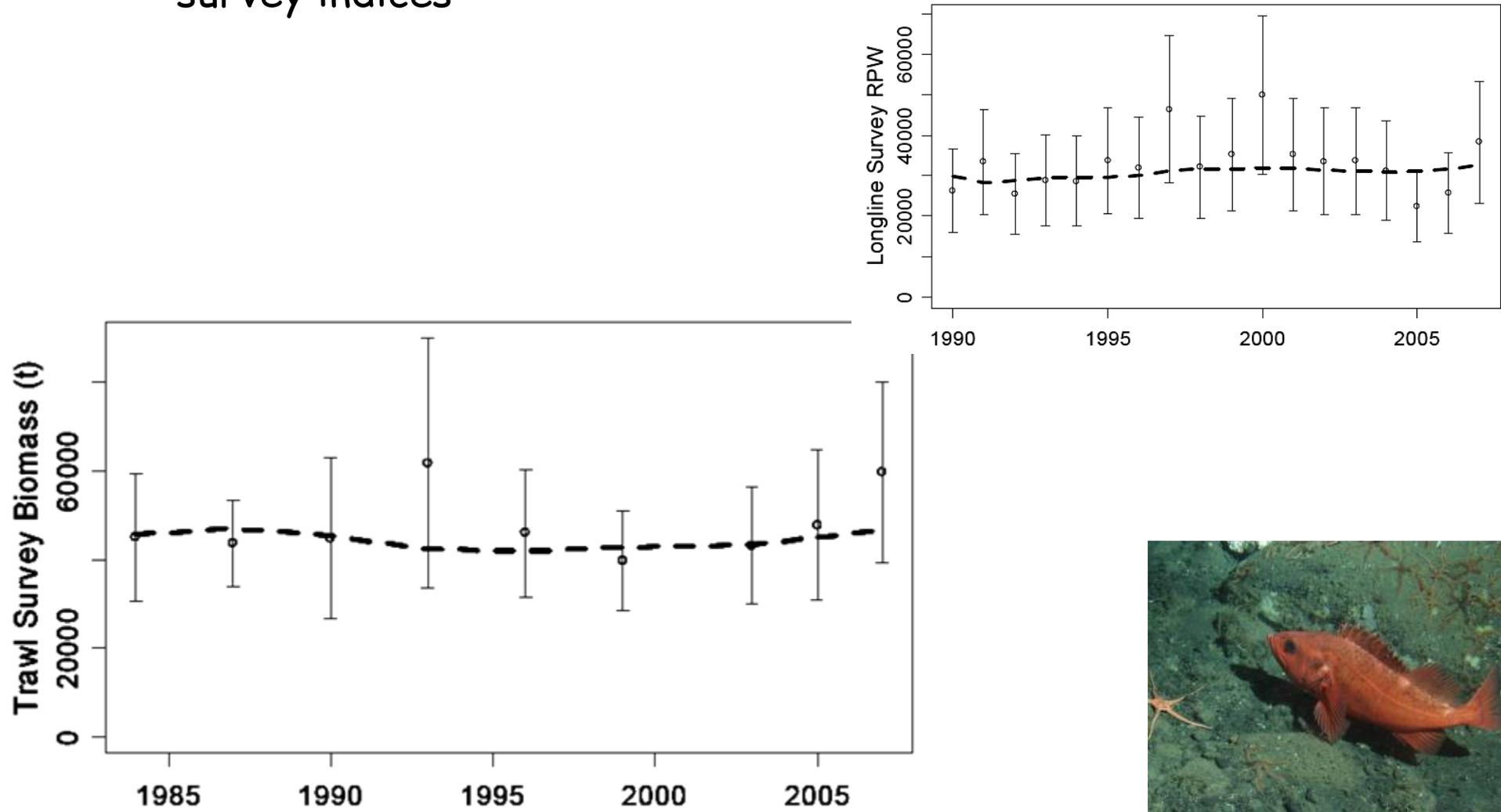
2007



Rougheye rockfish

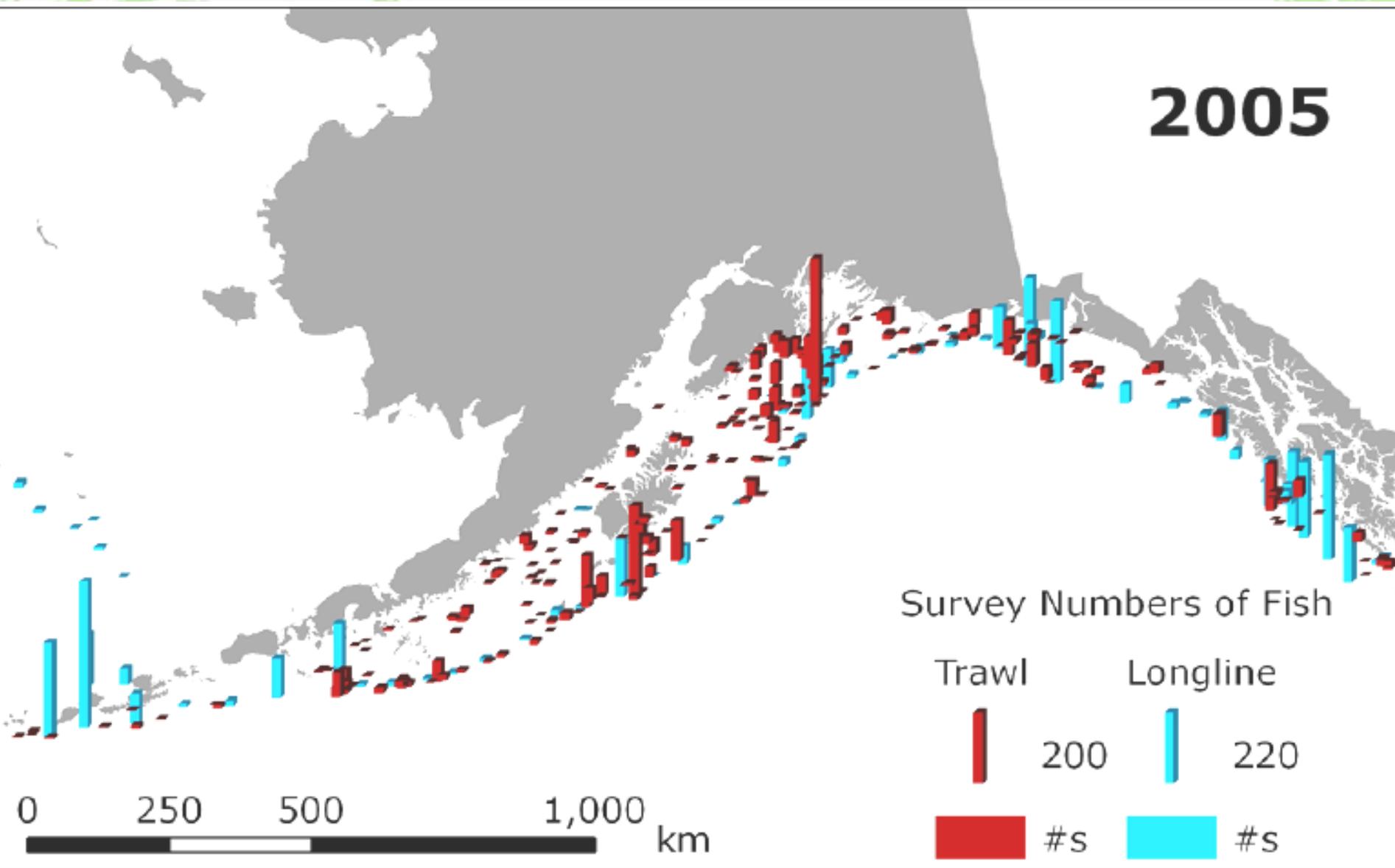
Age-structured assessment

Sensitivity to trawl and longline survey indices

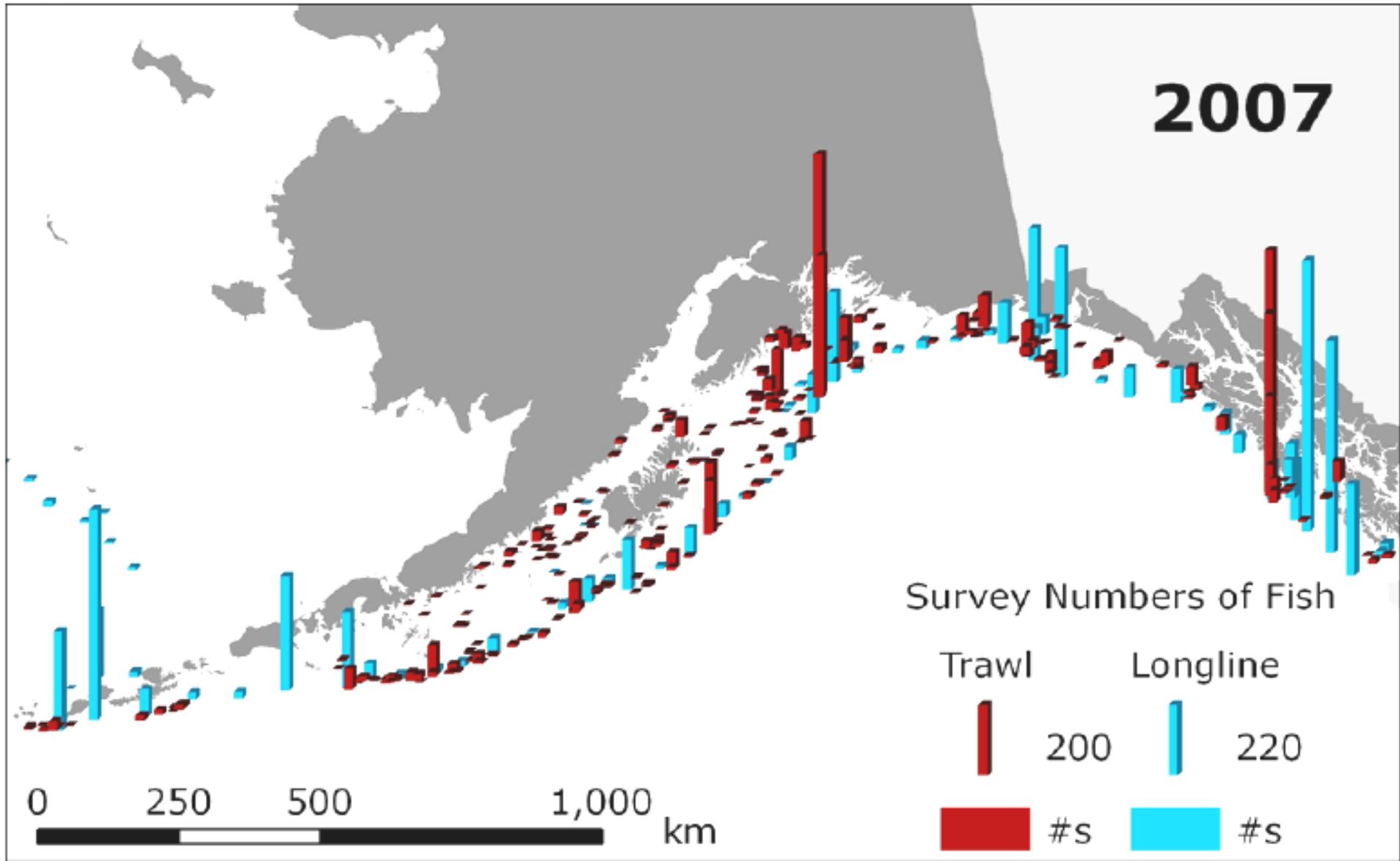


Rougheye rockfish surveys

2005



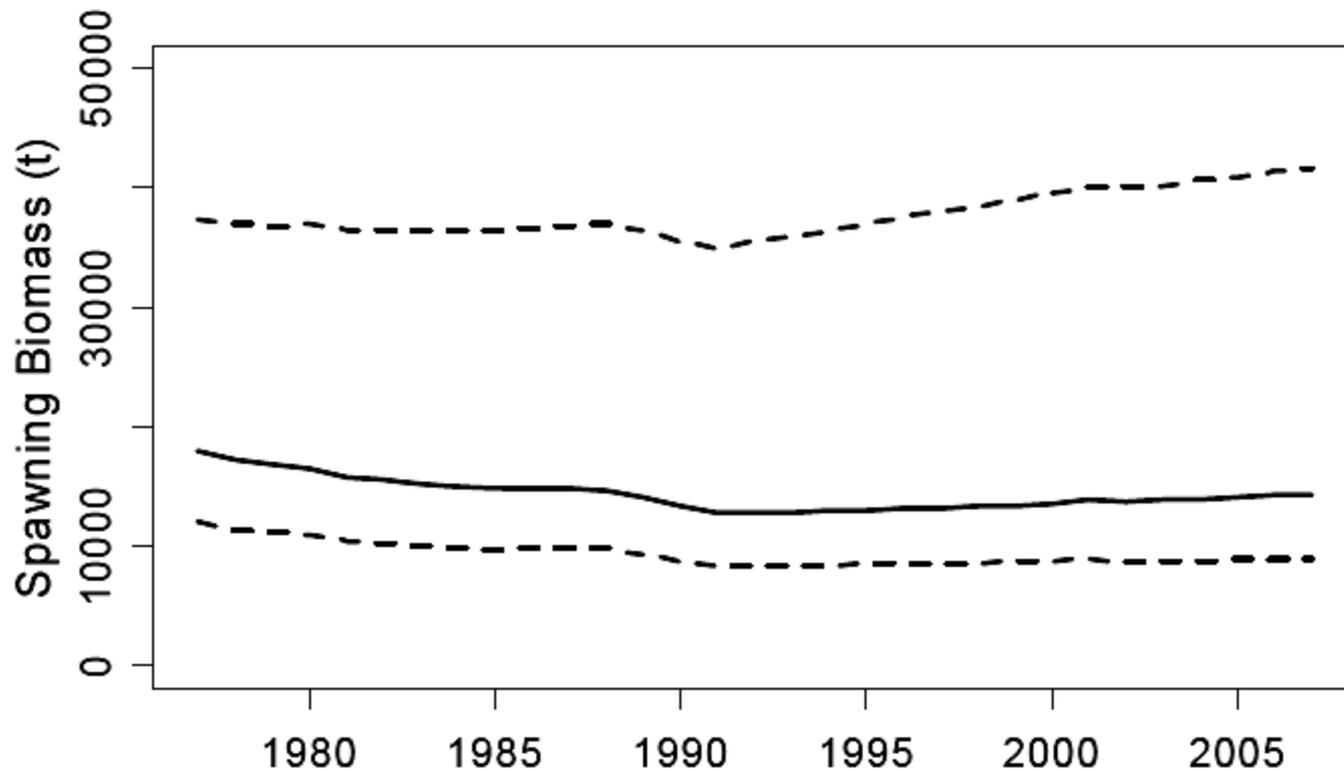
Rougheye rockfish surveys



Rougeye rockfish

Tier 3a

Rougeye	Biomass	OFL	ABC
2008	46,121	1,548	1,286
2009		1,540	1,279



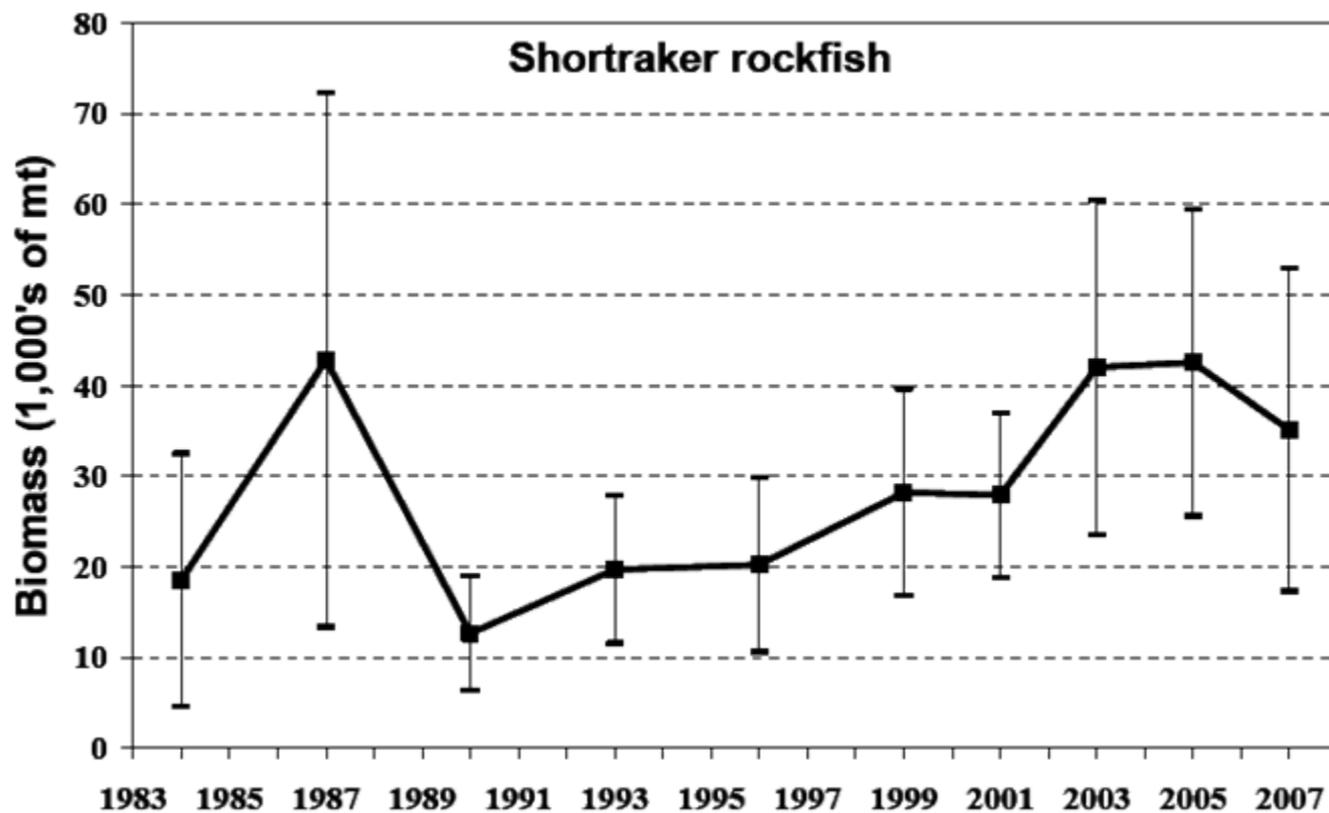
Other slope, shortraker rockfish

Shortraker	Biomass	OFL	ABC
2008	39,905	1,197	898
2009		1,197	898

Other slope:

Other slope rockfish	Biomass	OFL	ABC
2008	90,283	5,624	4,297
2009		5,624	4,297

Sharpchin rockfish
 Redstripe rockfish
 Harlequin rockfish
 Silvergray rockfish
 Redbanded rockfish
 Darkblotched rockfish
 Splitnose rockfish
 Greenstriped rockfish
 Vermilion rockfish
 Bocaccio
 Pygmy rockfish
 Yellowmouth rockfish

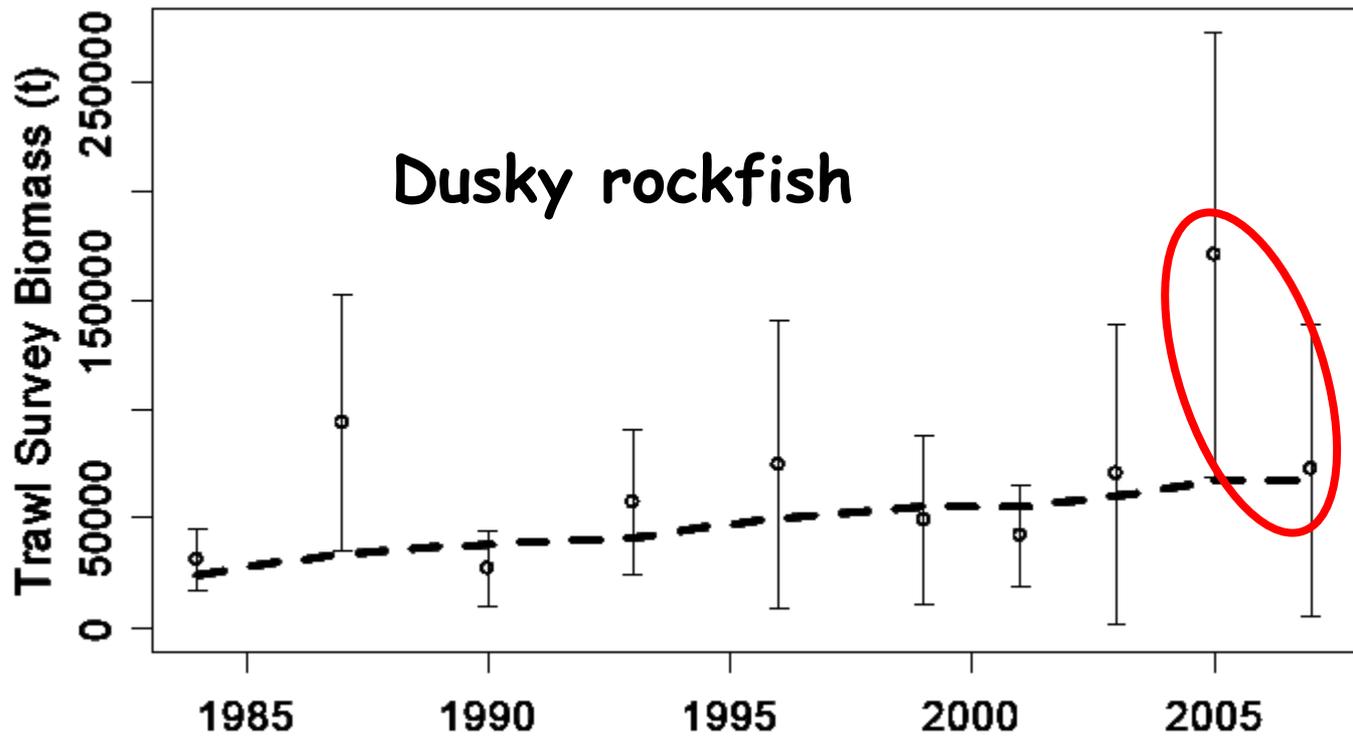


Pelagic Shelf rockfish

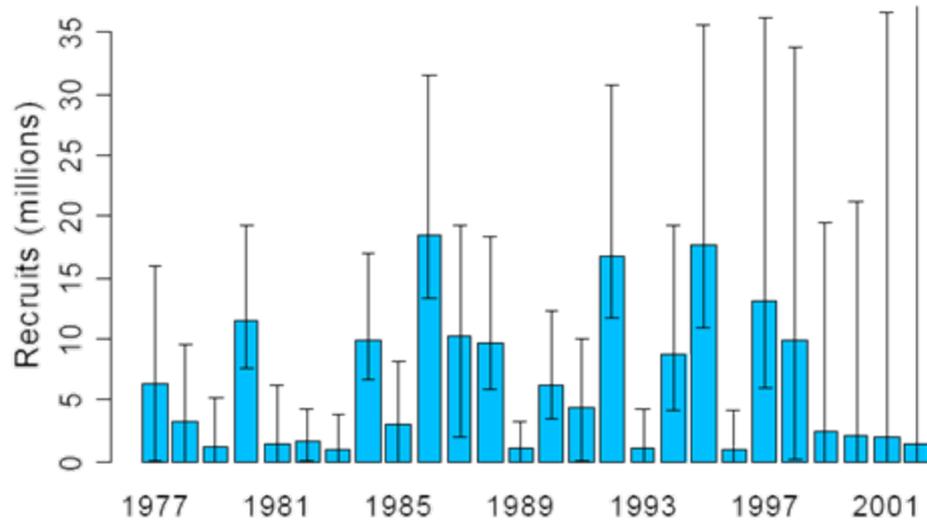


Management tiers combined for aggregate ABC

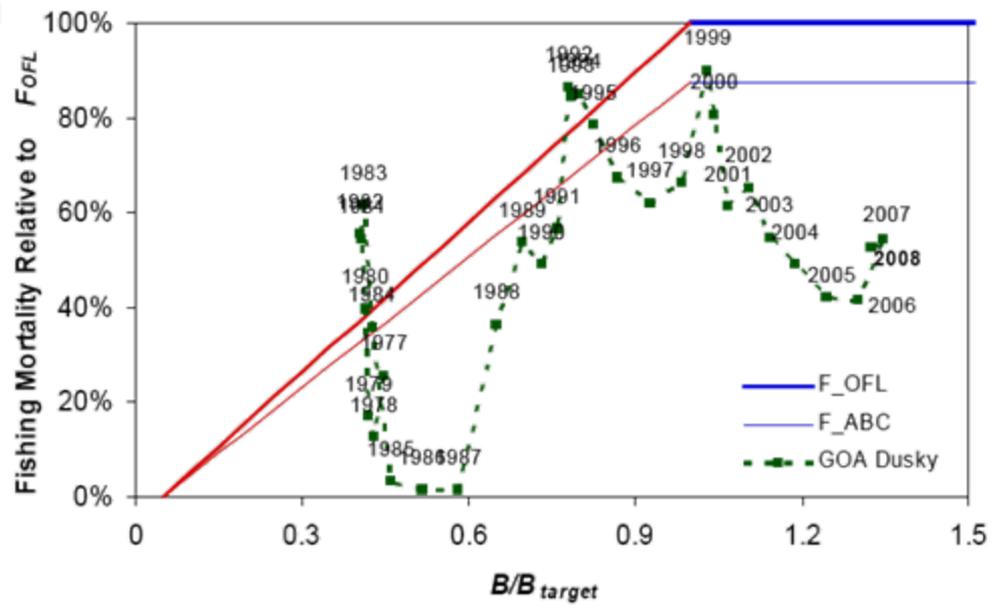
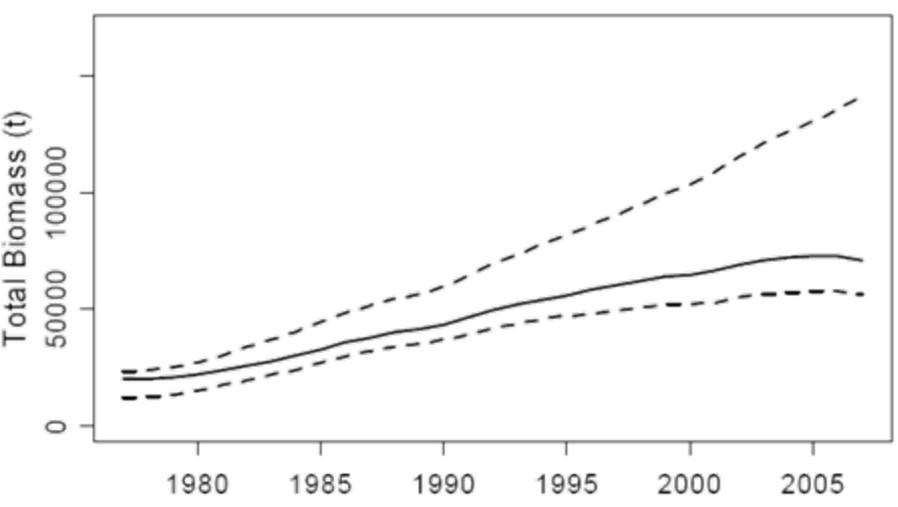
- ♦ Dusky: Tier 3a, based on age-structured model
- ♦ Dark (remove to State in 2009), widow, yellowtail: Tier 5



Dusky rockfish

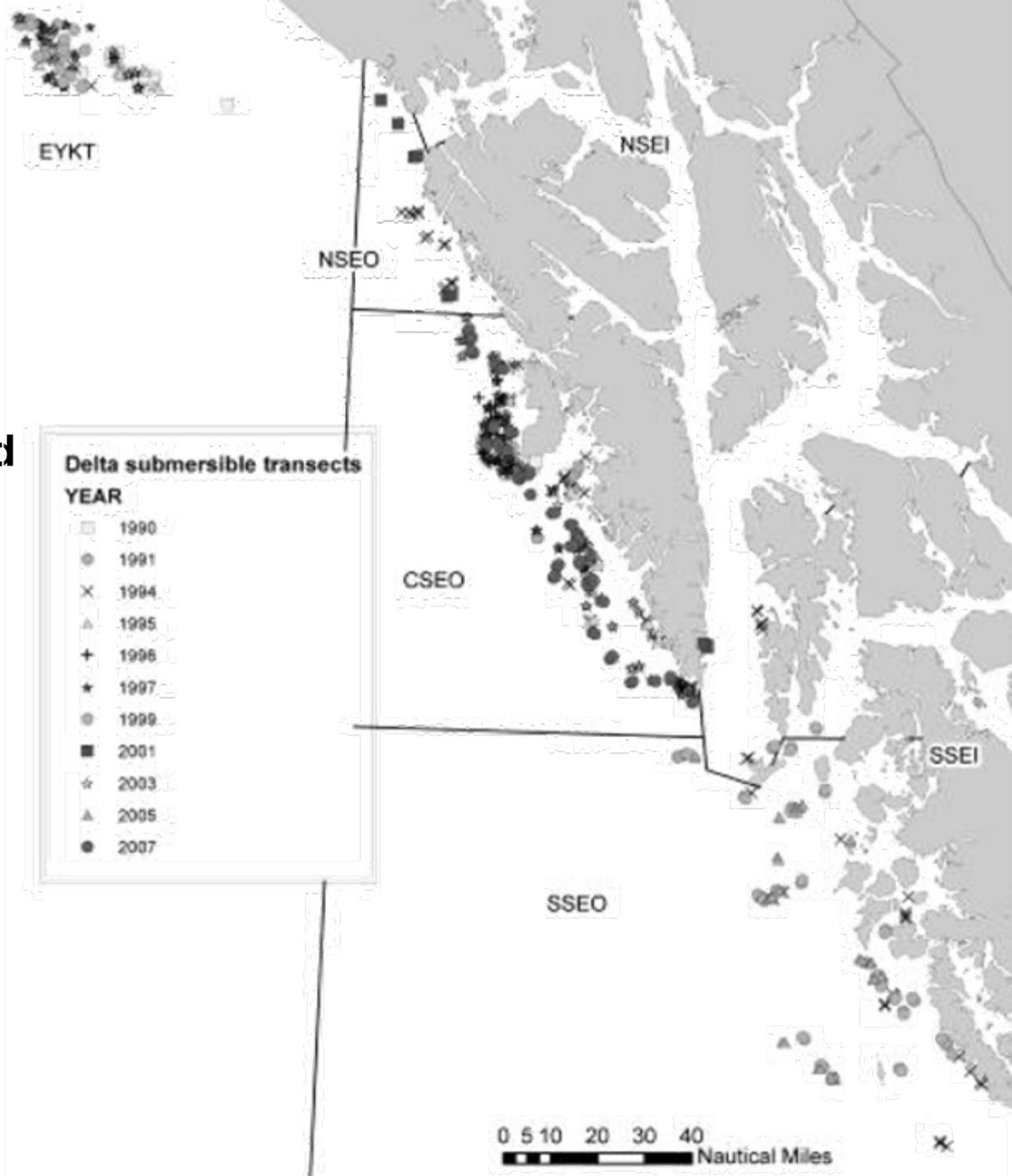


Pelagic shelf rockfish	Biomass	OFL	ABC
2008	70,823	6,400	5,227
2009		6,294	5,140



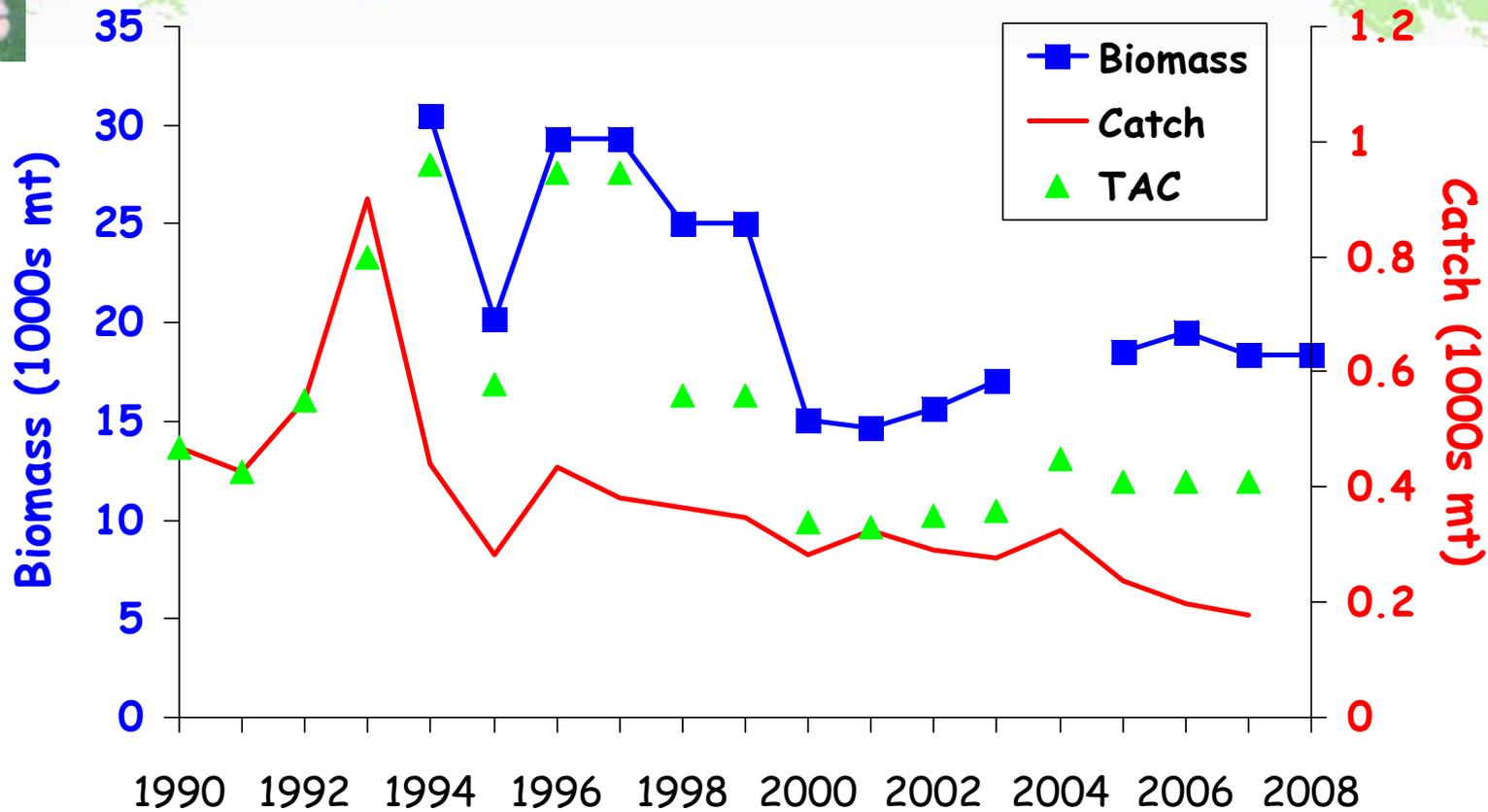
Demersal shelf rockfish

Mainly yelloweye rockfish
Bycatch issues highlighted
New survey conducted in 2007



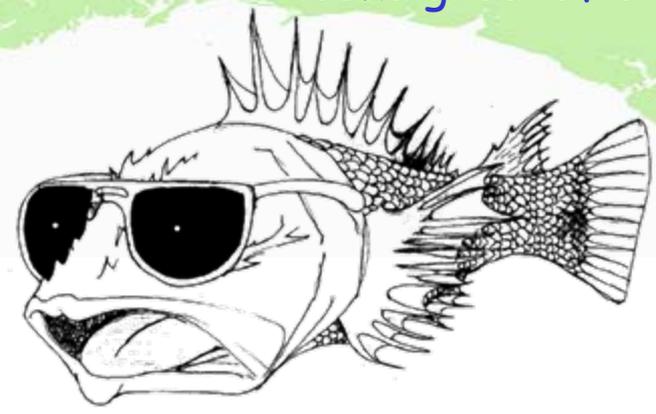


Demersal shelf rockfish

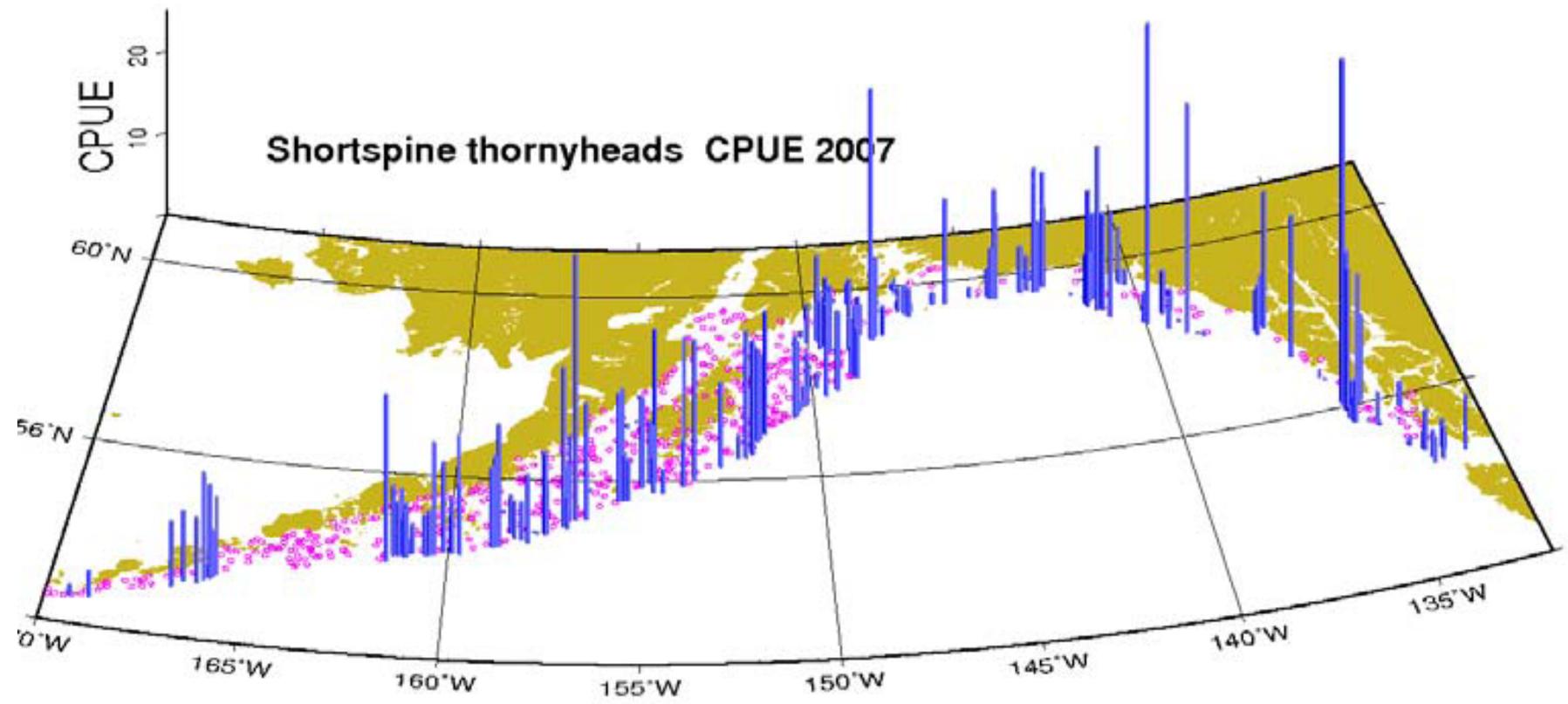


Demersal shelf rockfish	Biomass	OFL	ABC
2008	18,329	611	382
2009		611	382

Shortspine thornyheads



Survey estimate down from 2005
No directed fishery (but important)

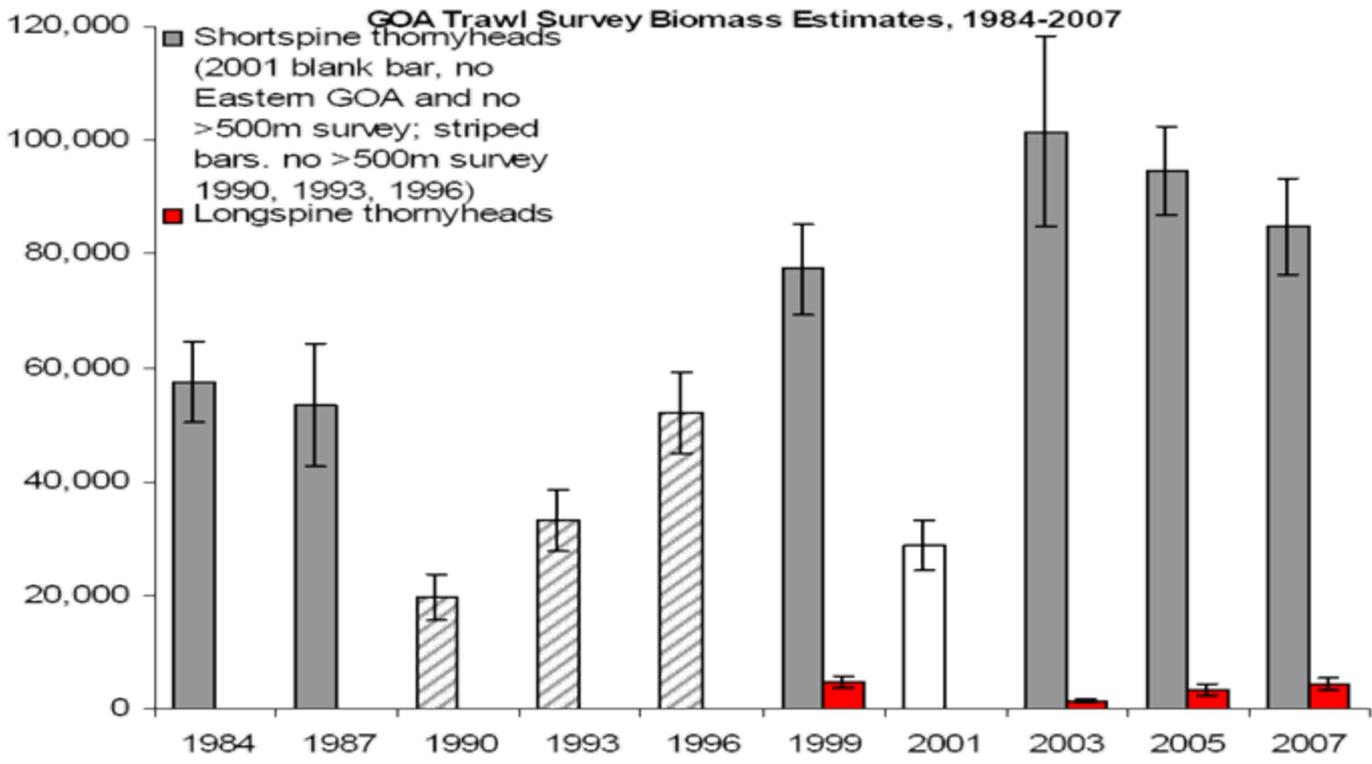


Shortspine thornyheads

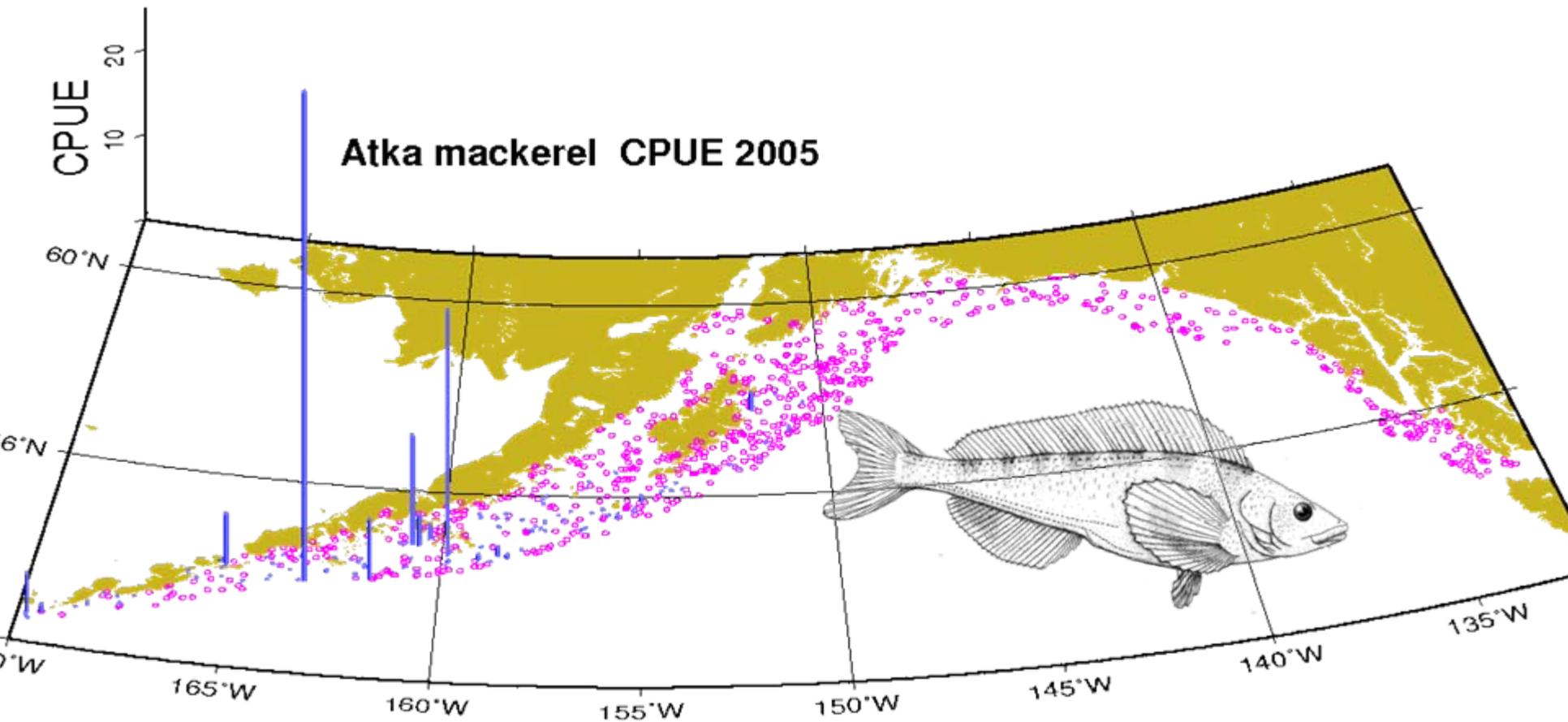


Tier 5

	Biomass	OFL	ABC
2008	84,774	2,540	1,910
2009		2,540	1,910

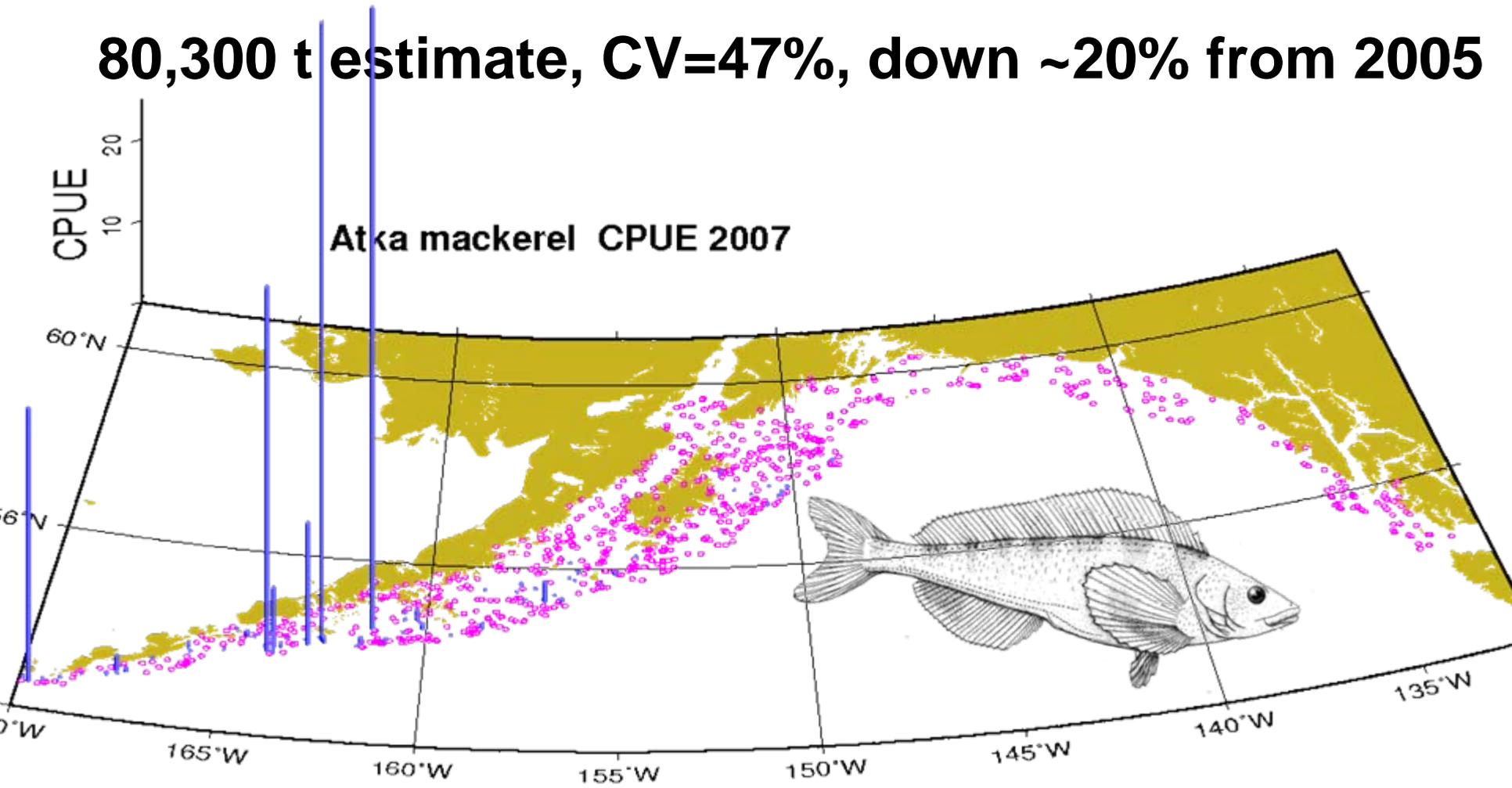


Atka mackerel 2005 survey



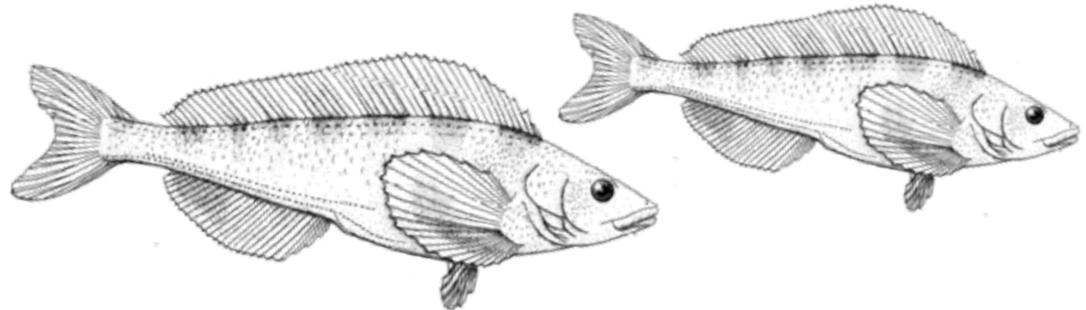
Atka mackerel 2007 survey

80,300 t estimate, CV=47%, down ~20% from 2005



Atka mackerel

- **Tier 6 species**
- **No directed fishing since 1996**
 - ♦ Bycatch mainly in rockfish fishery relatively stable
- **TAC set to meet incidental catch levels**
- **Concerns about single year class (1999)**
- **ABC = 4,700 (TAC=1,500 t)**
 - ♦ Tier 5 analogue would be 18,120 t



ABC Summary



Species	2007 catch	2007	2008	Change
Pollock	51,779	68,307	60,180	down 8,127 (12%)
Pacific Cod	36,696	68,859	66,493	down 2,366 (3%)
Sablefish	12,539	14,310	12,720	down 1,590 (11%)
Flatfish	14,260	108,367	123,759	up 15,392 (14%)
Arrowtooth flounder	25,073	184,008	226,470	up 42,462 (23%)
Rockfish	22,816	33,720	33,548	down 172 (1%)
Atka mackerel	1,441	4,700	4,700	same (0%)
Skates	3,498	8,056	8,321	up 265 (3%)
Total	168,102	490,327	536,191	up 45,864 (9%)

Summary: Page 36

Chapter: Page 957

Skates

- **In GOA, 2 main target species**
 - ♦ Big skate (*Raja binoculata*)
 - ♦ Longnose skate (*Raja rhina*)
- **3rd group composed of many species**
 - ♦ *Bathyraja spp.*
 - ♦ not targeted to date

Rough relative biomass estimates (in GOA)

Big skate ~50%,

longnose about 32%,

~18% to *Bathyraja spp.*

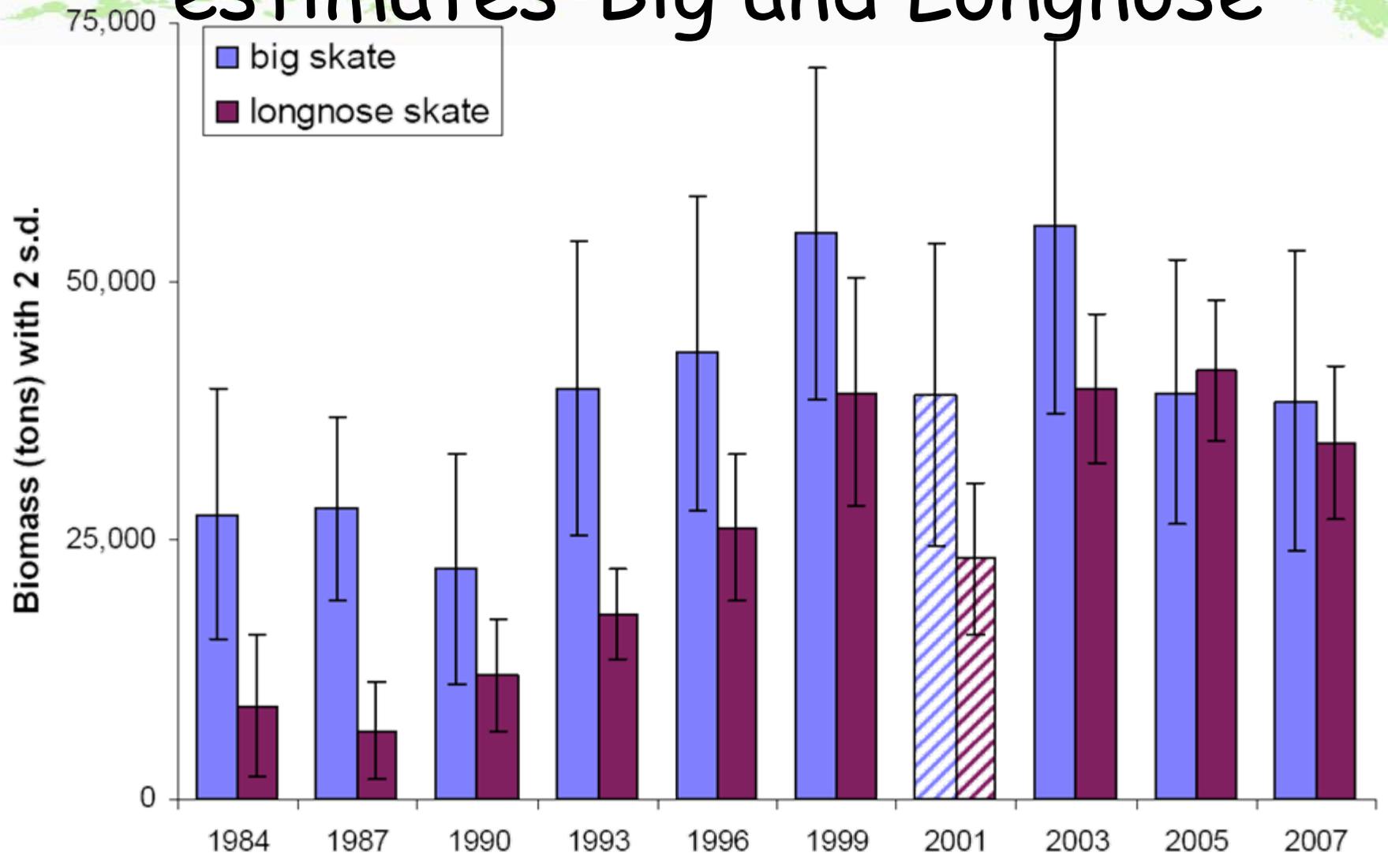


Skates

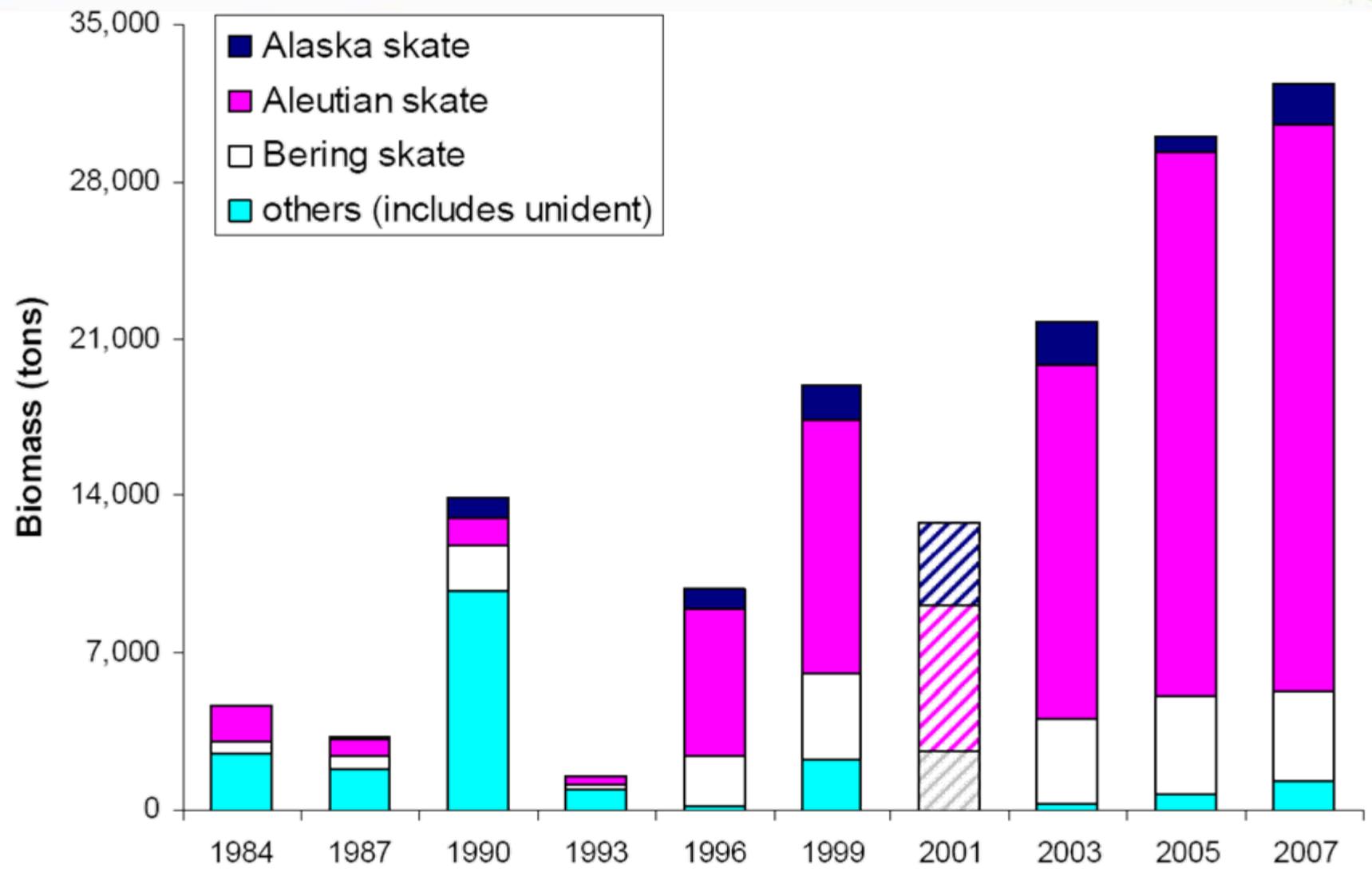


Species	2007 catch	2007	2008	Change	
Big skate	1,294	3,544	3,330	down 214	(6%)
Longnose skate	1,100	2,895	2,887	down 8	(0%)
Other skate	1,104	1,617	2,104	up 487	(30%)
All skates	3,498	8,056	8,321	up 265	(3%)

Skate survey biomass estimates - Big and Longnose



Other skates...



Skates ABC/OFL

Tier 5

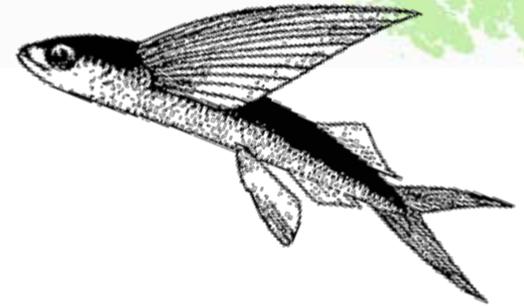
Age-structured model may be available for Big and/or longnose skates next year

Big skates	Biomass	OFL	ABC
2008	44,400	4,439	3,330
2009		4,439	3,330

Longnose skates	Biomass	OFL	ABC
2008	38,490	3,849	2,887
2009		3,849	2,887

Other Skates	Biomass	OFL	ABC
2008	28,057	2,806	2,104
2009		2,806	2,104

Other species



Preliminary assessments updated as appendices

- ♦ SSC reviewed in December 2006
- ♦ Include: Squid, sharks, sculpins, octopus, and grenadiers
- ♦ Team previously (2006) recommended ABCs and OFLs for amendment analysis
- ♦ Some additional Team recommendations for analysis including evaluation of dogfish separately from remaining shark species, and consideration of including squid in forage fish category